Vol. 10, No. 19
October 15, 1985

Energy Research Abstracts

Abstracts 38662-41103

Office of Scientific & Technical Information
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications that are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the Energy Data Base of the Office of Scientific and Technical Information; all references are also available for machine searching via the on-line retrieval system, DOE/RECON, and the commercial on-line retrieval systems. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below. Department of Energy components may receive the listed publications free from the Office of Scientific and Technical Information, U. S. Department of Energy, P. O. Box 62, Oak Ridge, TN 37831. Telephone (615) 576-1301; FTS 626-1301.

PUBLICATIONS OF THE OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION

Energy Abstracts for Policy Analysis (EAPA)

A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize legislative, regulatory, and other legal aspects, as well as social, economic, and environmental impacts. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The annual subscription price is $72.00 for domestic (North America) or $90.00 for foreign (outside North America) subscribers; a single issue is $5.00 or $6.25, respectively.

Energy Research Abstracts (ERA)

A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. *ERA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The annual subscription price for the 24 issues is $146.00 for domestic (North America) subscribers or $182.50 for foreign (outside North America) subscribers. A single issue is $14.00 or $17.50, respectively.

DOE Patents Available for Licensing (PAL)

DOE is prepared to grant exclusive or nonexclusive, revocable licenses under DOE-owned U. S. patents and patent applications; this semiannual publication provides abstracting and indexing coverage of this literature. *PAL* is available on subscription (use PB85-946800) from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. The annual subscription price is $14.00 for domestic (North America) or $28.00 for foreign (outside North America); a single issue is $8.00 or $16.00, respectively.

Energy Meetings (EM)

A monthly listing of conferences, symposia, workshops, etc., pertaining to DOE's programmatic interests. *EM* is available on subscription (use PB85-901500) from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. The annual subscription price is $40.00 for domestic subscribers and $80.00 for subscribers outside the North American continent; a single issue is $5.00 and $10.00, respectively.

The following monthly update journals are available to the public on subscription from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161; use the identifying order number (PB- No.) when subscribing. The annual subscription price (12 issues plus cumulative index) is $75.00 for domestic (North America) and $150.00 for foreign (outside North America) subscribers; a single issue is $7.00 and $14.00, respectively.

***Current Energy Patents (CEP)*–PB85-902800**

Devoted to international patent literature, including patent applications, on any aspect of energy production, conservation, and utilization.

***Energy and the Environment (EAE)*–PB85-914900**

Devoted to information on the impacts of energy-related activities and radioactive and nonradioactive pollutants on the environment.

***Fossil Energy Update (FEU)*–PB85-914600**

Devoted to information on the exploration, development, processing, and use of fossil fuels.

***Fusion Energy Update (CFU)*–PB85-915300**

Devoted to information on controlled thermonuclear fusion, including plasma and fuel research and power plant engineering and conceptual design studies.

***Solar Energy Update (SEU)*–PB85-914500**

Devoted to information on the utilization of solar energy, including biomass and tidal and wind power.

The following semimonthly bulletins are also available from the National Technical Information Service. The annual subscription rate for one volume (calendar) year (24 issues; no indexes) is $40.00 for domestic (North America) and $80.00 for foreign (outside North America) subscribers; use the identifying order number (PB- No.) when subscribing.

***Acid Precipitation (APC)*–PB85-901000**

Covers all aspects of acid precipitation, including effects and possible control measures.

***Buildings Energy Conservation (BEC)*–PB85-900700**

Covers worldwide information on the technology required for energy conservation in buildings of all types.

***Coal-Based Synfuels (CBS)*–PB85-901400**

Covers all aspects of conversion of coal into gaseous or liquid fuels.

***Coal Preparation and Pollution Control (CPC)*–PB85-900800**

Covers all aspects of coal preparation and cleaning and reducing pollution from its direct combustion.

***Direct Energy Conversion (DEC)*–PB85-946600**

Covers the following areas: photovoltaics, magnetohydrodynamics, electrohydrodynamics, thermoelectrics, thermionics, and fuel cells.

***Energy from Biomass (EFB)*–PB85-900600**

Covers worldwide information on all aspects of biomass production, conversion, and utilization for energy.

***Geothermal Energy Technology (GET)*–PB85-914700**

Covers information on the exploration, development, and utilization of geothermal resources.

***Heavy-Ion Reactions (HIR)*– PB85-900500**

Covers all aspects of heavy-ion (A > 4) reactions.

***Laser Research (LAR)*–PB85-901100**

Covers all aspects of laser research and development, but excludes applications.

***Nuclear Fuel Cycle (NFC)*–PB85-913400**

Covers all aspects of the nuclear fuel cycle, both front end and back end.

***Nuclear Reactor Safety (NRS)*–PB85-913500**

Covers the safety aspects of accident analysis, safety systems, radiation protection, decommissioning and dismantling, and security measures.

***Radioactive Waste Management (RWM)*–PB85-902900**

Covers the management aspects of transport and storage, waste processing, waste disposal, waste storage, radioactive effluents, and shipping containers.

***Solar Thermal Energy Technology (STT)*–PB85-901200**

Covers research in materials, concentrators/receivers, salinity gradients, etc., for development of efficient and reliable solar thermal conversion systems.

***Unconventional Petroleum (UCP)*–PB85-901300**

Covers all aspects of secondary and tertiary recovery of petroleum and of oil shales and tar sands.

INTERNATIONAL ENERGY PUBLICATIONS

The Office of Scientific and Technical Information (OSTI) cooperates in the publication of international abstract journals with the following: (1) International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria, for *Atomindex;* (2) International Energy Agency, Biomass Conversion Technical Information Service, Dublin, Ireland, for *Biomass Abstracts;* and (3) International Energy Agency, IEA Coal Research, London, England, for *Coal Abstracts.* In each case, the cognizant foreign agency provides the non-U. S. information to OSTI for inclusion in the Energy Data Base; in turn, OSTI provides the U. S. information for input into the respective journal.

Atomindex

A semimonthly abstract journal providing worldwide coverage of information on nuclear science and technology. *Atomindex* is available by subscription from UNIPUB, 345 Park Avenue South, New York, NY 10010. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $290.

Biomass Abstracts

A bimonthly abstract journal with comprehensive coverage of information in any step involved in the eventual conversion of biomass to energy. *Biomass Abstracts* is available free to Department of Energy components and contractors from OSTI. Non-DOE organizations may obtain *Biomass Abstracts* from Biomass Conversion Technical Information Service, Institute for Industrial Research and Standards, Ballymun Road, Dublin 9, Ireland, for 42 IR pounds per year. Make checks payable to the Institute.

Coal Abstracts

A monthly abstract journal providing comprehensive worldwide coverage of information in the field of coal science and technology. *Coal Abstracts* is available to Department of Energy components and contractors from OSTI. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England, for 100 pounds sterling per year.

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ENERGY RESEARCH ABSTRACTS

ABOUT THE OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION

The Office of Scientific and Technical Information (OSTI) in Oak Ridge, Tennessee, has been the national center for scientific and technical information for the Department of Energy (DOE) and its predecessor agencies since 1946. In developing and managing DOE's technical information program, OSTI places under bibliographic control not only DOE-originated information but also worldwide literature on scientific and technical advances in the energy field and announces the source and availability of this information. Whereas the literature of science is emphasized, coverage is extended to DOE programmatic, socioeconomic, environmental, legislative/regulatory, energy analysis, and policy-related areas. To accomplish this mission, OSTI builds and maintains computerized energy-information data bases and disseminates this information via computerized retrieval systems and announcement publications such as abstracting journals, bibliographies, and update journals. Direct access to OSTI's most comprehensive data base, the Energy Data Base, is available to the public through commercial on-line bibliographic retrieval systems. The Energy Data Base and many of OSTI's energy-related data bases are available to DOE offices and contractors and to other government agencies via DOE/RECON, the Department's on-line information retrieval system. The Office of Scientific and Technical Information has developed and maintains systems to record and communicate energy-related research-in-progress information, to maintain a register of DOE public communications publications, to track research report deliverables from DOE contractors, and to test and make available DOE-funded computer software programs with scientific and management applications; OSTI also serves as adviser for special publication needs of the Department. To effectively manage DOE's technical information resources, OSTI's program is one of continual development and evaluation of new information products, systems, and technologies.

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ABOUT *ENERGY RESEARCH ABSTRACTS*

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

ERA is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Inquiries should be directed to the Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

ERA is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $146.00 for domestic subscribers and $182.50 for foreign subscribers. A single issue costs $14.00 (domestic) or $17.50 (foreign). The cumulative indexes will be available in printed form from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The GPO Stock Number is 061-000-00657-5 and the price is $83.00 for the Vol. 9 indexes. The cumulative indexes are also available in microfiche form from the National Technical Information Service, U. S. Department of Commerce, Springfield, VA 22161, and from Engineered Systems, P. O. Box 866, Oak Ridge, TN 37831.

Office of Scientific and Technical Information
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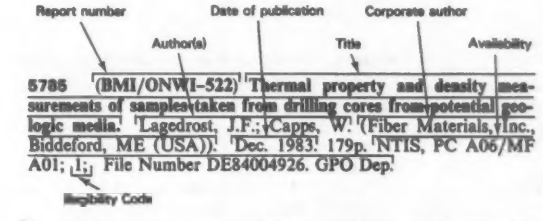
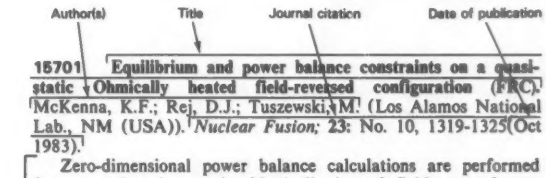
ABSTRACTS IN *ENERGY RESEARCH ABSTRACTS*

The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.


Report number
Date of publication
Corporate author
Author(s)
Title
Availability
5785 (BMI/ONWI-522) Thermal property and density measurements of samples taken from drilling cores from potential geologic media. Lagedrost, J.F.; Capps, W. (Fiber Materials, Inc., Biddeford, ME (USA)). Dec. 1983. 179p. NTIS, PC A06/MF A01; 1; File Number DE84004926. GPO Dep.
Availability Code

Abstract

Density, steady-state conductivity, enthalpy, specific heat, heat capacity, thermal diffusivity and linear thermal expansion were measured on 59 materials from core drill samples of several geologic media, including rock salt, basalt, and other associated rocks from 7 potential sites for nuclear waste isolation. The measurements were conducted from or near to room temperature up to 500°C, or to lower temperatures if limited by specimen cracking or fracturing. Ample documentation establishes the reliability of the property measurement methods and the accuracy of the results.


Author(s)
Title
Journal citation
Date of publication
15701 Equilibrium and power balance constraints on a quasi-static Ohmically heated field-reversed configuration (FRC). McKenna, K.F.; Rej, D.J.; Tuszewski, M. (Los Alamos National Lab., NM (USA)). Nuclear Fusion; 23: No. 10, 1319-1325 (Oct 1983).

Abstract

Zero-dimensional power balance calculations are performed for a quasi-static, purely Ohmically heated field-reversed configuration. Without compression, the constraint imposed by radial pressure balance limits the power input. Estimates of the energy loss from impurity line radiation as well as from classical and anomalous transport are given. Effects of cold puff gas injection are also investigated.

INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

• Corporate Author Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

5785 (BMI/ONWI-522) Thermal property and density measurements of samples taken from drilling cores from potential geologic media. Lagedrost, J.F.; Capps, W. **(Fiber Materials, Inc., Biddeford, ME (USA)).** Dec. 1983. 179p. NTIS File Number DE84004926. GPO Dep.

is indexed as:

Fiber Materials, Inc., Biddeford, ME (USA)

• Personal Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Capps, W., *See* Lagedrost, J. F.
Lagedrost, J.F., Thermal property and density measurements of samples taken from drilling cores from potential geologic media, 9:5785 (R;US)
McKenna, K.F., Equilibrium and power balance constraints on a quasi-static Ohmically heated field-reversed configuration (FRC), 9:15701 (J;US)
Rej, D.J., *See* McKenna, K.F.
Tuszewski, M., *See* McKenna, K.F.

• Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles, informative phrases, or both specific to these entries are arranged alphabetically under the entries.

SALT DEPOSITS
Density
Thermal property and density measurements of samples taken from drilling cores from potential geologic media, 9:5785 (R;US)
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• Contract Number Index

DOE technical report literature is indexed using contract numbers. This index contains the contract number with corresponding abstract and report numbers.

AC06-76RL01830	**Fiber Materials, Inc., Biddeford, ME (USA)**	
	9:5785	BMI/ONWI-522

• Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience. When a report is supplied under a File Number, that number is included in the availability statement. A file number–report number correlation is included for convenience.

BMI/ONWI-522	9:5785	NTIS, PC A09/MF A01. File Number DE84004926, Distribution Category MN-70

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Foreign Sources

CEA Centre d'Etudes de Saclay
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Fachinformationszentrum
Energie, Physik, Mathematik GmbH
Karlsruhe, Federal Republic of Germany

IEA Biomass Conversion Service
Dublin, Ireland

IEA Coal Research
Technical Information Service
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International Atomic Energy Agency
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National Institutes of Health
National Library of Medicine
Bethesda, MD

Plenum Publishing Corporation
New York, NY

University of Tennessee
Graduate School of Library and Information Sciences
Knoxville, TN

Communication concerning the editorial policy and content of *Energy Research Abstracts* should be addressed to the Editor, *Energy Research Abstracts,* Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 39 first-level and 293 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semi-monthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope definitions and limitations is available as DOE/TIC-4584-R6 from NTIS for $9.50.

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REFER ALSO TO CITATION(S) 38714, 38720, 38751, 38768, 38809, 39427

38662 (ANL/FE—84-21) Corrosion behavior and mechanical properties of silicon carbide exposed to a coal gasification environment. Easler, T.E. (Argonne National Lab., IL (USA)). Jun 1985. Contract W-31-109-ENG-38. 50p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015239.

Silicon carbide ceramic materials have been shown to have exceptional properties for many engineering applications. In the case of coal gasification systems, potential applications such as high-temperature heat exchangers must withstand a very hostile environment. This study included an evaluation of the effects of a coal gasification environment on the physical and mechanical properties of a silicon carbide ceramic. The corrosion behavior of specimens exposed in the absence or presence of a coal slag coating, and subsequent changes in mechanical properties, were evaluated. It was found that very little change in the specimens occurred after 200-h exposures at temperatures ranging from 1000 to 1300°C, when coal slag was not applied. Samples exposed with a coal slag coating exhibited no change after exposure at the lowest temperature, 1000°C. However, samples exposed at 1250 and 1300°C, with a slag coating, exhibited weight loss and some degradation of mechanical properties due to slag/silicon carbide interactions. Evidence of the formation of a protective silica scale between the slag and the silicon carbide suggests that the corrosion reactions may be inhibited after an initial reaction period. 21 refs., 21 figs., 10 tabs.

38663 (BMFT-FB-T—84-261) Study of the coking mechanisms of coal tar pitches and its constituents for the purpose of formation of high-grade needle coke and development of in-situ-methods for technical production. Holley, C.; Trendelenburg, T. (Karlsruhe Univ. (T.H.) (Germany, F.R.). Inst. fuer Chemische Technik; Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 233p. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE85752191.

With 125 refs., 36 tabs., 160 figs. .

It is possible to reduce needle coke from coal tar pitches after separation of the primary insolubles. From tests in technical scale it is known that these pitches show a different coking behaviour than the normally used petroleum pitches. Industry is actually developing a new adapted coking process as well as a needle coke with improved quality. The report is concerned with basic research to these two projects. Specially prepared pitch fractions and model compounds were pyrolysed to this purpose. The chemical structures of the starting materials were connected with the resulting mesophase formation which allows to classify pitches by division into fractions. It is shown that the average molecular size is an important parameter in these proceedings. The in situ hot stage microscopy and -rheology supplies the informations which are necessary for an optimum adjustment of the process parameters. An improvement of the thermal expansion values of the cokes was especially achieved by shearing during pyrolysis.

38664 (BMFT-FB-T—84-276) Optimization and operation of a small-scale test plant for brown coal hydrogenation. Dolkemeyer, W.; Gajewski, F.; Giehr, A.; Goettsch, P.; Ritter, G.; Lenz, U. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 69p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE85752190.

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With 2 tabs., 23 figs. .

During 1978-1983 based on PDU-results a new concept for the hydroliquefaction of brown coal was elaborated which is characterized by the following process steps: sump-phase hydrogenation under pressures between 200 and 300 bar, partial recirculation of the hot-separator-bottom product, processing of the hot-separator-bottom product by distillation or supercritical fluid extraction, recycle of supercritical fluid extract and use of hydrogen sulfide as a cocatalyst. The technical-scale work has been completed. On basis of these results the basic engineering and authority permittance for a pilot plant were performed. The detail engineering originally planed subsequent to the basic engineering and authority permittance will not be dealt with for the time being due to the present economic situation.

38665 (CONF-830308—15) Coking in coal liquefaction process equipment: a preliminary data correlation. Frazier, G.C.; Edwards, R.E.; Lin, K.H. (Tennessee Univ., Knoxville (USA); Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 27p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015048.

From American Institute of Chemical Engineers national meeting; Houston, TX, USA (27 Mar 1983).

Operational data from the Wilsonville SRC-I pilot plant fired preheater and a simple model of the coking process have been used to develop a preliminary, incipient coking correlation in terms of processing parameters, including the inlet hydrogen partial pressure, coal fraction in the slurry, a solvent quality index, coil outer surface temperature, and an estimated slurry contact time. Regression analysis shows, in agreement with qualitative statements in the literature, that coal properties including nitrogen, sulfur, oxygen, and vitrinite contents also contribute significantly to the correlation. However, additional operational data and more complete coal analyses are required in order to provide a broader foundation for further development of correlations of the proposed type. 14 refs.

38666 (CONF-850942—12) Isotope effects in supercritical water: kinetic studies of coal liquefaction. Ross, D.S.; Hum, G.P.; Miin, T.C.; Green, T.K.; Mansani, R. (SRI International, Menlo Park, CA (USA); Western Kentucky Univ., Bowling Green (USA); Eniricerche S.p.A., Milan (Italy)). 1985. Contract FG22-83PC60778. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85010649.

From 190. American Chemical Society national meeting; Chicago, IL, USA (8 Sep 1985).

Batch runs were performed using samples on an Illinois No. 6 coal in a stirred, 300 ml stainless steel autoclave. All the runs were for 20 min at 400°C. The only product considered is the toluene-soluble (TS) fraction, separated from the toluene-insoluble fraction by simple filtration. In contrast to the more-or-less reducing capacity available in conventional donor systems, the CO/water system offered considerable latitude. We had earlier demonstrated that changes in the initial pH of the system brought about wide variation in the TS yields. In accordance with the findings of several other groups, the conversions were found to be base promoted. The present study included a range of initial pH values, and focussed on a comparison of the results in H_2O with those from a substitution in parallel experiments of D_2O. The major finding in this work is the isotope effect. We find that the deuterio system provides higher TS yields than does the protio system. Moreover, the deuterio results level off at a substantially higher conversion level. This result, an inverse isotope effect, is not very common in isotope effect studies. The implication of these findings as regards conversion mechanism and structure is discussed. In summary, we find that the conversion is not limited by coal structure, but rather by the kinetics of the reducing step(s). Systems with even greater

reducing capacity, and where the water gas shift reaction can be suppressed, should provide even higher conversions to toluene-soluble products. The products in turn should be no less rich in hydrogen than those from lower conversion runs. 11 refs., 5 figs.

38667 **(DOE/ET/13031—T4-Vol.1) Pipeline gas demonstration plant: Phase I. Record environmental analysis report. Volume I.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Sep 1979. Contract AC01-77ET13031. 363p. (FE—2012-077-Vol.1). NTIS, PC A16/MF A01; 1; GPO Dep. File Number DE85015324.

The Illinois Coal Gasification Group's Pipeline Gas Demonstration Plant is a self-contained facility designed to convert approximately 2330 tons of coal per day into synthetic pipeline gas (SPG) and several by-products. Approximately 24.0 million standard cubic feet per day (MM SCFD) of SPG will be produced from the Illinois coal. The goals of the construction and operation of the Demonstration Plant are threefold: To demonstrate the technical, environmental, and economic feasibilities of producing clean pipeline gas from coal; to obtain data to improve the state of the art in coal gasification; and to advance the commercial production of pipeline gas from coal. The proposed site for the Demonstration Plant is in southwestern Perry County, Illinois. The Perry County site was selected primarily because of the availability of coal, proximity to a more-than-adequate water supply (the Mississippi River), accessibility by several modes of transportation, abundant labor force, and minimal impacts on the environment from Plant construction and operation. Major wastes from the Demonstration Plant will include slag, water treatment sludges and sulfite sludges, carbon dioxide, and desulfurized flue gas. All liquid wastes will be treated, the water being removed and then recycled for use within the Plant in order to achieve zero liquid discharge. Solid wastes produced from the various processes will be disposed of in an onsite landfill. Because of the previously disturbed nature of the environment on the Plant site proper and the surrounding environs, the effect of the facility on the physical and biological environments will be minimal at most, and the most apparent physical effect will be a minor degradation of air quality.

38668 **(DOE/ET/13031—T4-Vol.3) Pipeline gas demonstration plant, Phase I. Record environmental analysis report. Volume III.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Sep 1979. Contract AC01-77ET13031. 226p. (FE—2012-077-Vol.3). NTIS, PC A11/MF A01; 1; GPO Dep. File Number DE85015335.

The Water Resources Report has been prepared for the Pipeline Gas Demonstration Plant Program for a Demonstration Plant to be built in Perry County, Illinois, under DOE Contract No. FE-77-C-01-2012. The information presented herein is required to evaluate the hydrological setting of the site. The report describes the regional physiographic and climatic setting, the nature of surface water and groundwater resources at the site and in the site vicinity. Included is discussion of surface water drainage, streamflow, reservoirs, groundwater geology, aquifers, and surface water and groundwater quality. This volume also includes extensive air quality data.

38669 **(DOE/ET/13031—T4-Vol.4) Pipeline gas demonstration plant, Phase I. Record environmental analysis report. Volume IV.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Sep 1979. Contract AC01-77ET13031. 438p. (FE—2012-077-Vol.4). NTIS, PC A19/MF A01; 1; GPO Dep. File Number DE85015336.

This volume is a description of the terrestrial and aquatic biology onsite, along the pipeline right-of-way, and at the water intake location. This description was developed using field data gathered at these locations from October 1977 to September 1978. The water quality of site surface waters is included.

38670 **(DOE/ET/13031—T4-Vol.5) Pipeline gas demonstration plant, Phase I. Record environmental analysis report. Volume V.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Sep 1979. Contract AC01-77ET13031. 229p. (FE—2012-077-Vol.5). NTIS, PC A11/MF A01; 1; GPO Dep. File Number DE85015337.

The archaeological survey of the Willisville-Rockwood water pipeline right-of-way, part of the proposed Illinois Coal Gasification Group Pipeline Gas Demonstration Plant, located sixty archaeological resources. Of these, fifty will be directly impacted by construction of the proposed pipeline. The survey area formed a narrow corridor (30 m x 32 km) lying in the uplands of southwestern Illinois. Coverage was effected through a pedestrian survey supplemented by shovel probes and artifact collections. The majority of the resources are prehistoric, limited activity, lithic scatters which date from the Early Archaic period to Late Woodland. These resources are considered significant for answering questions about human adaptation in the upland zone of the Ozark-Shawnee Hills region. As such, taken as a body, they are potentially eligible for inclusion on the National Register of Historic Places. A subsurface testing program is recommended for eleven prehistoric sites in order to help finalize a determination of National Register status. This volume also includes characteristics of several local communities: location, climate, population, work forces (availability of spilled labor), schools, educational facilities, transportation facilities, water supplies, industrial sites, etc.

38671 **(DOE/ET/13031—T5) Pipeline Gas Demonstration Plant, Phase I. Local resources survey report.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Aug 1978. Contract AC01-77ET13031. 48p. (FE—2012-042). NTIS, PC A03/MF A01; GPO Dep. File Number DE85015326.

The investigation of local resources disclosed that all modes of transportation - airports, railroads, waterways, highways and pipelines are available within 50 miles of the proposed plant site. One of the major airports of the country, St. Louis International Airport, is only 75 miles from the site. Adequate electric and telephone facilities are available for the plant, as well as off-site support use. The surrounding communities have existing sewer and water systems that will be used by families of the plant personnel and supporting commercial and domestic establishments. However, the plant will be self-sufficient with its own water supply and sewage treatment facilities. The surrounding local government agencies provide adequate schools, medical facilities and police and fire protection, which also includes ambulance service. Statistics indicate that adequate housing is available in the surrounding twelve county area. Within a 50 mile commuting distance from the plant site (a 12 county area), there is a large labor pool resource available for constructing and operating the Demonstration Plant. If present conditions (1977) continue, only three or four construction trades would need outside manpower to adequately staff the peak labor force needed.

38672 **(DOE/ET/13031—T6) Pipeline Gas Demonstration Plant, Phase I. Site survey report.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Sep 1978. Contract AC01-77ET13031. 12p. (FE—2012-043). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015327.

The site survey and mapping has been prepared for the Pipeline Gas Demonstration Plant Program, for a demonstration plant to be built in Perry County, Illinois, under DOE Contract No. FE-77-C-01-2012. The information presented herein is required to evaluate the topographic conditions at the plant site. The report includes an aerial photograph, topographic maps, and a survey map that contain all the information necessary to establish topographic and terrain features, baselines and benchmarks needed for the plant layout and environmental studies. A brief narrative description of the physical features of the site defined by the maps and photography is included.

38673 **(DOE/ET/13031—T7) Pipeline gas demonstration plant: Phase I. Site transportation study report.** (Illinois Coal Gasification Group, Chicago (USA)). Sep 1978. Contract AC01-77ET13031. 33p. (FE—2012-044). NTIS, PC A03/MF A01; GPO Dep. File Number DE85015328.

The Site Transportation Study Report has been prepared for the Pipeline Gas Demonstration Plant Program, for a Demonstration Plant to be built in Perry County, Illinois. The information presented is required to evaluate the transportation capabilities and conditions at the site. The report describes the existing and planned transportation network (highway, rail, air, water and pipeline) serving the Demonstration Plant site area; and the carrying capacities

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and adequacies of the network for meeting the Plant's transportation demands for receiving feedstocks and construction materials, and for shipment of products and byproducts. Field observations were made at the site and along primary roads in the site area to qualitatively assess the adequacies of these roads for construction and operation of the Demonstration Plant. The transportation study found that the various transportation systems existing in the site area have been developed and are maintained at levels and conditions which will adequately accommodate the needs and demands of the Demonstration Plant. Existing rail, truck, barge, pipeline or air transit systems are adequate for the transportation of construction materials and feedstocks to the site, and for the shipment of products and byproducts from the site to market users. The local highway network is adequate for the transportation of workers to and from the site.

38674 **(DOE/ET/13031—T8) Pipeline gas demonstration plant: Phase I. Climatological and meteorological report.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Sep 1978. Contract AC01-77ET13031. 34p. (FE—2012-045). NTIS, PC A03/MF A01; GPO Dep. File Number DE85015329.

The Climate and Meteorological Data Report has been prepared for the Pipeline Gas Demonstration Plant Program, for a Demonstration Plant to be built in Perry County, Illinois, under DOE Contract No. FE-77-C-01-2012. The information presented herein is required to evaluate climate at the Plant site. The report describes the recent climate at the Demonstration Plant site area. Trends of air temperature, wind speed and direction, humidity and precipitation, extreme weather and air quality are evaluated for stations in southwest Illinois and eastern Missouri. The capacity of the atmosphere over the site region to disperse gaseous emissions is evaluated. Existing air quality is evaluated with reference to state and federal regulations. Three sources provided the data for the analyses and evaluations described in the text of this report. Most of the regional data was collected by the National Oceanic and Atmospheric Administration and made available through the Environmental Data Service. Some information was taken from the open literature. Meteorology and air quality measurements made under the direction of Gibbs and Hill personnel site specific data.

38675 **(DOE/ET/13031—T9) Pipeline Gas demonstration plant, Phase I. Site environmental survey report.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Sep 1978. Contract AC01-77ET13031. 80p. (FE—2012-048). NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85015332.

The report describes the various elements of the process, including study area definition, literature search and identification of data gaps, identification of field data to be acquired, and the design of surveys and baseline monitoring programs to obtain these data in the field. The environmental baseline, which will ultimately be documented as a major element of the project environmental assessment report, will combine existing pertinent literature with data obtained in the field from interviews, surveys, and monitoring programs. Although a considerable amount of data was available for most of the topics of study for determining the environmental baseline, a number of field baseline data collection programs were found to be necessary. Programs were designed and technical specifications prepared for the following studies: Preliminary geotechnical and hydrology investigation, meteorology and air quality, aquatic biology, terrestrial biology and archaeological resources. A baseline noise measurement program was prepared but a technical specification was not necessary because measurements were made by Gibbs and Hill staff. Topographic mapping specifications were prepared as a parallel effort for site evaluation (Task III) and are reported in the Site Survey Report FE-2012-043, September, 1978. Data for land use and development characteristics, and regional demographic, socioeconomic and economic characteristics were found to be sufficient for baseline and environmental assessment. No field studies will be required.

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38676 **(DOE/ET/13031—T10) Pipeline gas demonstration plant, Phase I. Preliminary foundation investigation and soil analysis report. Appendix B.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Sep 1978. Contract AC01-77ET13031. 28p. (FE—2012-046). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015330.

This report presents the results of studies made to evaluate the seismic design criteria considering the design earthquake, soil structure interaction and soil settlement for the proposed pipeline gas demonstration plant to be constructed on a site one mile east of Willisville, Perry County, Illinois. It is understood that the geotechnical investigations for foundation design by McClelland Engineers Inc. of St. Louis are planned in two phases; of which segment I has been completed. The results of the segment I study indicate that seismic considerations may have a major impact on foundation cost. Therefore, prior to undertaking the second phase of the geotechnical studies, an independent study was initiated in order to supplement MEI's report with respect to seismic motion. Specifically the scope of services, outlined in your contract CPD-7051, include the following tasks: (1) Discuss the seismicity of the plant site as it may be applicable including earthquake acceleration, magnitude, velocity and displacement potential between bedrock and soil. (2) It is intended that the facility design will be in accordance with the Uniform Building Code, 1976 Edition. Correlate design criteria of Uniform Building Code particle motion, for zone 3, described in MEI's segment I report and bedrock acceleration established by Algermissen and Perkins, USGS Open File Report 74-416. Four other tasks are described briefly.

38677 **(DOE/ET/13031—T11) Pipeline gas demonstration plant. Site master plan report.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Jul 1980. Contract AC01-77ET13031. 28p. (FE—2012/Z/80/07). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015333.

Illinois Coal Gasification Group (ICGG) and the United States Department of Energy executed Contract No. EF-77-C-01-2012 on June 7, 1977. This contract requires ICGG, as Contractor, to analyze, design, construct, test, evaluate, and operate a Demonstration Plant capable of manufacturing pipeline quality gas from a blend of Illinois No. 5 and 6 seam coal. One of the assignments (Task III of Phase I) of the contract is to select and evaluate the site for constructing the Demonstration Plant. A site consisting of about 400 acres has been selected in Perry County, Illinois. This site lies in the southern half of Section 20 and the Western half of Section 21, Township 6 South, Range 4 East, about 1 mile east of Willisville. As part of Task III, a site master plan is required. This document is the Site Master Plan. The Site Master Plan delineates the location of the Demonstration Plant within the site, access to the site during construction and operation, areas to be used by the construction contractor for storage, temporary offices, etc., and availability of utilities during construction and operation. Support data for this plan include topographical data, soils conditions, climate information, and available transportation facilities. The support data have been reported previously.

38678 **(DOE/ET/13031—T12) Pipeline Gas Demonstration Plant, Phase I. Site water resources report.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Sep 1978. Contract AC01-77ET13031. 59p. (FE—2012-047). NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85015331.

Water for the proposed Demonstration Coal Conversion Plant will be taken from the Mississippi River. The water intake structure will be located approximately 7 miles downstream of Chester, Illinois. The estimated water withdrawal rate will be approximately 2.34 cubic feet per second (CFS) which represents about 0.0013% of the annual average river flow. Since the available water flow rate is so much larger than the water withdrawal rate for the proposed Plant, no seasonal or long term hydrological effects are anticipated. Since local surface water and ground water resouces will not be used, there will be no impact to them. In the vicinity of the site, surface waters have low flow rates and often no flow conditions occur. Water quality is generally poor due to many existing point source discharges and surface runoff quality. The proposed Demonstration Plant is designed for zero discharge.

Wastes emanating from the gasification process, the gas purification system, cooling facilities, drainage from areas potentially contaminated with coal or process residuals and sanitary wastes will be treated onsite and the water recycled within the plant. Thus there will be no impact on the water quality of surface waters of the groundwater regime.

38679 **(DOE/FE/60177—1881, pp 3.1-3.18) Underground coal gasification.** 15 Feb 1984. NTIS, PC A04/MF A01. File Number DE85009913.

In Oil shales, tar sands, and underground coal gasification. Quarterly technical progress report, October-December 1984.

The first successful UCG test in the block reactor has produced an average gas heating value of 150 Btu/scf corresponding to a linear cavity growth rate of 2 ft/day at a pressure of 100 psi. These results of gasification in a 2 x 2 x 5-foot block of Hanna subbituminous coal are similar to those from the Hanna field tests. This test has also demonstrated some successful equipment modifications which are expected to improve the operation of the block reactor with oil shale and tar sand resources. The TEQ model for equilibrium coal combustion has been modified to calculate the effect of reaction pressure on product gas composition. Evaluation of the CRIP-UCG and Hanna IV tests is continuing. Some pre-experiment planning for a second CRIP experiment is in progress. A literature review was initiated to identify coal deposits in Wyoming within 2000 feet in depth and 5 miles in distance of tar sand and heavy oil deposits. This work is intended to show the feasibility of using energy from UCG to recover other resources in remote areas. Based on analyses of the Hanna UCG site data from a University of Arizona tracer study, groundwater velocities and contaminant movement were quantified. Efforts were initiated to characterize the organic constituents found in the Hoe Creek well waters using a separation scheme with subsequent GC analysis of the resulting fractions. WRI continued solvent sublation experiments this quarter which were supplemented by solvent extraction experiments. Phenol was removed by 87 and 78% respectively by these processes. Preliminary analyses show that colloidal tar particles sized 10 to 15 μm were preferentially removed by solvent sublation. 2 refs., 3 figs., 2 tabs.

38680 **(DOE/FE/60181—129) Arrhenius activation energies of the reaction of low-rank coal chars and steam.** Timpe, R.C.; Farnum, S.A.; Galegher, S.J.; Hendrikson, J.G.; Fegley, M.M. (North Dakota Univ., Grand Forks (USA). Energy Research Center). Mar 1985. Contract FC21-83FE60181. 11p. (CONF-850942—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE85009611.

From 190. American Chemical Society national meeting; Chicago, IL, USA (8 Sep 1985).

The chemical reaction between coal char and steam to produce synthesis gas, CO and H_2, is well known. These products can be used directly as low-heating-value gas or as precursors for the catalytic synthesis of methanol and ammonia, oxo compounds, methane and petroleum substitutes. More recently, however, interest has centered on producing the gas for its hydrogen content. The hydrogen can be purified for use as a fuel. The rate of the reaction involving char and steam is increased markedly by the use of catalysts, particularly alkali metal compounds. Potassium carbonate, which is commonly recognized as the best alkali catalyst for this reaction was chosen as the catalyst to use in examining the gasification of chars prepared from Indian Head and Velva North Dakota lignites, and Wyodak Wyoming subbituminous coal. These three low-rank coals were converted to chars and then reacted with steam at 700°, 750° and 800°C both with and without K_2CO_3 catalyst. The course of the reaction was followed by thermogravimetric analysis (TGA). Sodium carbonate was also used to catalyze the Velva and Indian Head char-steam reactions. Sodium carbonate is a less expensive material than K_2CO_3 and, if shown to be an effective catalyst in place of K_2CO_3, could reduce considerably the cost of the conversion process. This paper reports the apparent Arrhenius energies of activation (Ea) and pre-exponential factors (A) for the steam gasification of the uncatalyzed and K_2CO_3-catalyzed Velva, Indian Head, and Wyodak coal chars, and the Na_2CO_3-catalyzed Velva and Indian Head coal chars. 10 refs., 7 figs., 4 tabs.

38681 **(DOE/FE/60181—131) Catalytic upgrading of solvent-refined lignite using hydrogen sulfide and prepared iron oxide-supported catalysts.** Jones, F.A.; Rindt, J.R.; Radonovich, L.J. (North Dakota Univ., Grand Forks (USA). Energy Research Center). Apr 1985. Contract FC21-83FE60181. 15p. (CONF-850942—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85009857.

From 190. American Chemical Society national meeting; Chicago, IL, USA (8 Sep 1985).

This paper discusses a catalytic system, H_2S-iron system that shows promise as an economical means of upgrading the heavy product from low-temperature direct liquefaction of low-rank coal. Four conclusions can be drawn from this study: (1) Product quality during catalytic upgrading with the H_2S-iron system was increased significantly at 420°C when compared with 360°C. (2) When H_2S and iron catalyst were not present in the system, thermal treatment of the soluble residuum at 420°C had no measurable beneficial effect. (3) Hydrogen sulfide worked primarily through the distillate. (4) Iron worked primarily through the heavy fraction of the recycle solvent. The mechanism involved hydrogen addition, as was evidenced by the increased H/C ratio. When these observations are added to previously reported data which indicated that added H_2S improves distillate yield, lowers gas yield, and improves operability in CPU recycle operation, it suggests that H_2S acts directly with the lighter fractions of the recycle solvent. In doing this H_2S acts to improve solvent quality, which indirectly improves conversion of the heavier fractions. This type of solvent quality enhancement can explain the lower gas yield associated with added H_2S. It also supports the previously referenced data which indicated that when iron additives were added during recycle operation, with no added H_2S, product quality as measured by H/C ratios was improved but operability was not. This preliminary evaluation of H_2S-iron catalysis points to additional areas for research, in both catalyst systems and their applications. 16 refs., 8 figs., 5 tabs.

38682 **(DOE/PC/30236—T3) Mechanisms of fatigue in metals under coal liquefaction conditions. Progress report, June 24-August 31, 1981.** Conrad, H. (North Carolina State Univ., Raleigh (USA). Dept. of Materials Engineering). 1981. Contract FG22-80PC30236. 12p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015775.

The objective of the present investigation is to carry out low-cycle fatigue experiments on a 316 type stainless steel under simulated coal liquefaction environments to evaluate the modes and mechanisms of fatigue failure. Preliminary tests are underway in which 316 stainless steel tensile specimens are being exposed to silicone oil and to a 5% napthenic acid in silicone oil mixture for periods of 16 h at 100°C. The initial microstructure of the 316 stainless steel and the changes in the dislocation and other defect structure will be characterized by modern metallographic techniques. The fatigue data are to be analyzed using the strain-range partitioning approach; the parameters obtained therefrom, will be correlated with the changes in microstructure. The experimental results are to be compared with theories of fatigue failure to identify the responsible mechanisms. 7 refs. 3 figs.

38683 **(DOE/PC/30264—3) Controlled flash pyrolysis. First quarterly technical progress report, September-December 1980.** Durai-Swamy, K.; Che, S.C.; Chen, C.B.; Jain, R.; Kim, S.S.; Von Schonfeldt, H. (Occidental Research Corp., Irvine, CA (USA)). Jan 1981. Contract AC22-80PC30264. 22p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015776.

This first quarterly report presents the objectives of the controlled Flash Pyrolysis research program and the work accomplished thus far. The start-up phase of the 1 Kg/h Controlled Flash Pyrolysis (CFP) unit is nearly completed. Wyodak coal was selected for use in the program. Char production from the Wyodak coal has been completed. Electron Spin Resonance (ESR) spectrometer has been ordered. It will be received in January 1981 and put in operation by the end of the next quarter. 5 refs., 3 figs., 2 tabs.

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38684 **(DOE/PC/50030—T11) Fluid seals development for coal liquefaction slurry pumps. Quarterly technical progress report No. 11, 1 April 1985-30 June 1985.** Burcham, R.E. (Rockwell International Corp., Canoga Park, CA (USA). Rocketdyne Div.). 22 Jul 1985. Contract AC22-82PC50030. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015264.

This quarterly progress report covers the work performed during the period 1 April 1985 to 30 June 1985 on the Fluid Seals Development for Coal Liquefaction Slurry Pumps Program. The work was sponsored by the Department of Energy, Pittsburgh Technology Center, to develop technology for hydrostatic fluid seals to be used in coal slurry centrifugal and reciprocating pumps. The scope of the program consists of the following tasks: (1) Task 1A: Survey of current practices for centrifugal and reciprocating coal slurry pump seals; (2) Task 1B: Preliminary evaluation of three alternative centrifugal and reciprocating fluid seal concepts; (3) Task 2: Detail evaluation of the best two centrifugal and reciprocating fluid seal concepts; (4) Task 3A: Design and fabrication of the selected centrifugal and reciprocating fluid seal concept, Design and fabrication of the centrifugal and reciprocating seal testers; (5) Task 3B: Laboratory seal testing of the centrifugal and reciprocating fluid seals; and (6) Task 4: Field testing of the centrifugal and reciprocating fluid seals. Tasks 1, 2, 3A, and 3B have been completed. Task 4 is in progress. 2 figs.

38685 **(DOE/PC/50033—T5) Syn-Fuel reciprocating charge pump improvement program. Quarterly technical project report, April-June 1984.** (Ingersoll-Rand Research, Inc., Princeton, NJ (USA)). 1984. Contract AC22-82PC50033. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85013012.

Major accomplishments during the second quarter of 1984 were completion of the Diaphragm Separation Seal clear liquid testing, and initiation of Phase III Field Testing. Diaphragm operational testing was conducted on a clear water test loop. The test goals were to ensure; mechanical reliability of the Diaphragm Seal, safe operation with simulated component failure, and proper operation of the Diaphragm Buffer Volume Control System. This latter system is essential in controlling the phasing of the diaphragm with its driving plunger. These tests were completed successfully. All operational problems were solved. However, it must be emphasized that the Diaphragm Seal would be damaged by allowing the pump to operate in a cavitating condition for an extended period of time. A change in the Field Test phase of the program was made regarding choice of field test site. There is no operating Syn-Fuel pilot plant capable of inexpensively producing the slurry stream required for the reciprocating pump testing. The Field Tests will now be conducted by first testing the prototype pump and separation seals in an ambient temperature sand water slurry. This will determine resistence to abrasive wear and determine any operation problems at pressure over a lengthy period of time. After successful conclusion of these tests the pump and seals will be operated with a high temperature oil, but without solids, to identify any problems associated with thermal gradients, thermal shock and differential growth. After successful completion of the high temperature clean oil tests the pump will be deemed ready for in-line installation at a designated Syn-Fuel pilot plant. The above approach avoids the expense and complications of a separate hot slurry test loop. It also reduces risk of operational problems while in-line at the pilot plant. 5 figs.

38686 **(DOE/PC/50793—T11) Combined processing of coal and heavy resids. Progress report, January 16, 1985-April 15, 1985.** Curtis, C.W.; Guin, J.A.; Tarrer, A.R. (Auburn Univ., AL (USA). Coal Conversion Lab.). 1985. Contract FG22-82PC50793. 68p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85014421.

The objective of this research is to determine the feasibility of using heavy petroleum crudes and residua in the processing of coal and to determine whether both coal and the petroleum solvent can be simultaneously upgraded. The effect of process parameters, the influence of solvent properties and composition and the role of the catalyst in coprocessing are being evaluated. The influence of solvent properties and composition and the effect of catalyst type and a variety of reaction parameters have been investigated in the coprocessing of heavy petroleum crudes and residua with Illinois No. 6 coal. Hydrotreatment of the solvent prior to using as a coprocessing solvent substantially improves the amount of coal conversion achieved. Catalytic treatment is required to produce significant quantities of pentane soluble material. The addition of hydroaromatic compounds at donable hydrogen levels of 0.55% or higher generally increases coal conversion and the amount of oil produced. The selectivity of different catalytic materials for upgrading the petroleum solvent and the coal specifically is evident and has been applied to two stage processing. This report is divided into three parts. Part I is a description of a study of adsorption and pore diffusion limitations in coprocessing. Part II describes the effect of solvent composition particularly the use of coal-derived solvents in conjunction with the petroleum solvent in coprocessing. Part III is an explanation of the relation of pore size to diffusivities given in the October 1984 to January 1985 Progress Report. 11 refs., 17 figs., 21 tabs.

38687 **(DOE/PC/60020—T1) Chemistry of the extractive phase of two-stage coal liquefaction. Quarterly report, January 1, 1984-March 31, 1984.** Heredy, L.A.; Skowronski, R.P.; McCoy, L.R.; Ratto, J.J. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). May 1984. Contract AC22-83PC60020. 26p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015124.

The experimental work described here is being carried out with the objective of identifying and quantifying key chemical linkages in the coal, coal extract, and process solvent used in a two-stage coal liquefaction process. The successful achievement of this objective will assist in defining the optimum conditions required for the operation of the first stage of the liquefaction process. Two principal investigative methods are being used to attain the above objective. One employs a phenol/BF_3 depolymerization reaction to rupture methylene bridges in the coal, coal extract, and process solvent to yield solvent-soluble products which can be subsequently identified by NMR spectroscopy, elemental analysis, and gas chromatographic methods. The second procedure, the Pd-catalyzed dehydrogenation of coal and coal-derived materials, provides a measure of the hydroaromatic content of these materials. The information derived from these tasks combined with other data derived from the literature will be analyzed to provide information regarding the structure of the essential materials used in and generated by the liquefaction process. During this reporting period, 3-fluorophenol was substituted for phenol in the depolymerization reaction to provide "tagged" reaction products and thus permit a quantitative measurement of phenol uptake. This work was also extended to include the coal extract residue as well as the feed coal, Illinois No. 6, used in the previous experiments. Nuclear magnetic resonance spectrometric analyses of the starting materials and reaction products were initiated. Further, fundamental investigations of the dehydrogenation procedure using 9,10-dihydroanthracene as a model compound were also conducted. The rate of gas evolution has been found to provide an apparent measure of the degree of dehydrogenation. 6 refs., 9 figs., 1 tab.

38688 **(DOE/PC/60020—T2) Chemistry of the extractive phase of two-stage coal liquefaction. Quarterly report, October 3, 1983-December 31, 1983.** Heredy, L.A.; Skowronski, R.P.; McCoy, L.R.; Ratto, J.J. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). Feb 1984. Contract AC22-83PC60020. 50p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015125.

Experimental work has been initiated with the objective of establishing procedures capable of identifying and quantifying key chemical linkages in the coal, coal extract, and process solvent used in a two-stage coal liquefaction process. The experimental work carried out during this period has been directed to (1) selection and preparation of a model compound having a structure similar to those of basic structural elements of the coal used in the process, (2) physical characterization of the coal extract and the process solvent, (3) catalytic dehydrogenation of model compounds, and (4) acid-catalyzed depolymerization of a sample of the coal. Illinois No. 6 coal was used in this work. This coal has been used as a feedstock in the Integrated Two-Stage Liquefaction Process Development Unit (PDU) being operated by the C.E. Lummus Company. Experiments have been carried out using a number of solvents in the dehydrogenation of tetralin and the model compound described

above. Durene and quinoline have been found most effective in achieving a near approach (85 to 91%) to the theoretical hydrogen yield in tetralin dehydrogenation. The process solvent from the Lummus PDU has been characterized by distillation, NMR spectroscopy, and molecular weight measurements. Analysis of the Lummus PDU extract has been initiated. Depolymerization of coal and process solvent using phenol and BF_3 is being conducted to establish the number and type of alkyl bridges in these materials. The initial experiments have defined the conditions for the depolymerization reaction and the detailed procedures to be used in conducting the solvent fractionation of the reaction products. 15 refs., 15 figs., 11 tabs.

38689 **(DOE/PC/60020—T3) Chemistry of the extractive phase of two stage liquefaction.** Neuworth, M.B.; Heredy, L.A.; McCoy, L.R.; Skowronski, R.P.; Ratto, J.J. (Mitre Corp., McLean, VA (USA). METREK Div.; Rockwell International Corp., Canoga Park, CA (USA). Rocketdyne Div.). 19 Apr 1985. Contract AC22-83PC60020. 132p. NTIS, PC A07/MF A01; GPO Dep. File Number DE85015122.

An experimental program has been conducted to investigate the chemistry of the extractive phase of the Integrated Two-Stage Liquefaction process. The long-term objective of the program is a study of the structural correlations between the starting coal, the coal-derived process solvent, and the primary liquefaction products. The two specific objectives chosen for study under this contract were (1) an investigation of experimental techniques for determining the proportion of cyclic and acyclic alkyl bridges as key weak linkages in coal and coal extract and (2) the generation of experimental information on hydroaromatic structures in coal and their probable role in liquefaction. The experimental technique which was devised for this investigation involved acid-catalyzed depolymerization to cleave methylene and other alkyl bridges in the coal and catalytic dehydrogenation to obtain information on hydroaromatic structures. The results of these experiments were supplemented by structural characterization of the process solvent and the coal extract, experiments using model compounds, and the application of results obtained by others. The experimental work was carried out using Illinois No. 6 coal, coal extract, and process solvent obtained from the PDU coal liquefaction plant operated by C.E. Lummus Crest, Inc. Coal depolymerization was carried out by using phenol-BF_3 and 3-fluorophenol-BF_3. Dehydrogenation of coal process solvent fraction and model compounds was carried out using a solvent and a palladium catalyst. The results and conclusions are discussed. 16 refs., 41 figs., 26 tabs.

38690 **(DOE/PC/60020—T4) Chemistry of the extractive phase of two-stage coal liquefaction. Quarterly report, April 1, 1984-June 31, 1984.** Heredy, L.A.; McCoy, L.R.; Skowronski, R.P.; Ratto, J.J. (Rockwell International Corp., Canoga Park, CA (USA). Rocketdyne Div.). Aug 1984. Contract AC22-83PC60020. 32p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015123.

The experimental work described here is being carried out with the objective of identifying and quantifying key chemical linkages in the coal, coal extract, and process solvent used in a two-stage coal liquefaction process. The successful achievement of this objective will assist in defining the optimum conditions required for the operation of the first stage of the liquefaction process. Two principal investigative methods are being used to attain the above objective. One employs a phenol/BF_3 depolymerization reaction to rupture methylene bridges in the coal, coal extract, and process solvent to yield solvent-soluble products which can be subsequently characterized by NMR spectroscopy, elemental analysis, and chromatographic methods. The second procedure, Pd-catalyzed dehydrogenation of coal and coal-derived materials, provides a measure of the hydroaromatic content of these materials. The information derived from these tasks, combined with other data derived from the literature, will be analyzed to provide information regarding the structure of the essential materials used in and generated by the liquefaction process. This report describes further studies of the depolymerization of coal and coal extract residue using 3-fluorophenol and BF_3 with emphasis on the analysis of the reaction products. The results of dehydrogenation experiments using two model compounds, octahydrophenanthrene and 9,10-dihydroanthracene, and of a distillation fraction of the process solvent are also presented. 8 refs., 5 figs., 8 tabs.

38691 **(DOE/PC/60044—T6) New and improved dispersion and recovery techniques for slurry phase catalysis. Quarterly progress report, January-March 1985.** Tarrer, A.R.; Curtis, C.W.; Guin, J.A.; Tatarchuk, B.J. (Auburn Univ., AL (USA). Coal Conversion Lab.). 1985. Contract AC22-83PC60044. 126p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE85014430.

Diffusion of reacting coal species through catalyst pores is an important factor in the kinetics of coal liquefaction reactions. The effect of diffusion on coal liquefaction reactions was studied using Illinois No. 6 coal and asphaltenes and preasphaltenes derived from Illinois No. 6 solvent refined coal. These reactions were performed with four different $NiMo/Al_2O_3$ extrudate sizes (1/10", 1/16", 1/32", and 1/64") and with each catalyst in powdered (-200 mesh) form. These catalysts were presulfided prior to use in 5% H_2S/H_2 gas stream. Thermal reactions were also performed. The upgrading of coal and preasphaltenes with large catalyst pellets produced much more conversion to products soluble in pentane, benzene, and methylene chloride/methanol than did the thermal reactions for each of the materials. In contrast, little improvement was observed in the asphaltene reaction with the presence of large catalyst pellets. Reducing the catalyst size significantly increased the degree of upgrading of all three materials. Decreasing the pellet size from 1/10" to -200 mesh caused a 21% increase in oil production in the reactions using coal, a 34% increase in the reactions using preasphaltenes and a 16% in the reactions using asphaltenes. Two kinetic models were developed for the reaction which showed that the catalytic rate constants increased as the catalyst size decreased for each of the reactants used. The preasphaltene fraction had the largest rate constants and they were most affected by the catalyst size. The rate constants for the asphaltene fraction changed the least with catalyst size, and the rate constants for coal were consistently the smallest. 41 refs., 15 figs., 24 tabs.

38692 **(DOE/PC/60054—T7) Coal liquefaction: investigation of reactor performance, role of catalysts and PCT properties. Quarterly progress report, April 1-June 30, 1985.** Brainard, A.J.; Shah, Y.T.; Tierney, J.W.; Wender, I.; Joseph, S.; Kerkar, A.; Ozturk, S.; Sayari, A. (Pittsburgh Univ., PA (USA)). 1985. Contract FG22-83PC60054. 6p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015104.

The objective of this work is to investigate areas of science and technology that have been defined as being of prime interest to coal processing technology development. These areas include properties of coal liquids and slurries, reactor design, and performance in relation to reaction mechanisms. The work comprises investigations of the following high priority areas: reaction kinetics and reactor performance in direct coal liquefaction; role of catalysts in indirect liquefaction and direct coal liquefaction; and physical, chemical, and thermodynamic properties of coal liquefaction products. This report summarizes work done during the period April 1, 1985 through June 30, 1985. A detailed description of work in each of the following three tasks is presented: (1) reactor kinetics and reactor performance in direct coal liquefaction (Fischer-Tropsch process, methanol-to-gasoline process, methanol synthesis); (2) role of catalysts in direct liquefaction and in indirect coal liquefaction; and (3) physical, chemical, and thermodynamic properties of coal liquefaction products.

38693 **(DOE/PC/60775—16) Experimental program for the development of an advanced wet carbonization process. Project 61070 topical Phase I report, August 12, 1983-December 31, 1984.** (Institute of Gas Technology, Chicago, IL (USA)). Jun 1985. Contract AC22-83PC60775. 207p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE85015008.

An existing continuous-flow Process Research Unit (PRU), designed and constructed under a previous DOE program for the wet carbonization of peat, was activated for tests in the current program. Peat from St. Louis County, Minnesota, was selected as the feedstock for the PRU tests, and ten successful tests were made. During these tests, the peat solids slurry concentration ranged from

6.1 to 9.5 wt %. The average reactor operating temperatures and residence times ranged from 350° to 500°F and 1 to 60 minutes, respectively. The heating value enhancement of the wet-carbonized peat reached 21% and the mechanically dewatered wet-carbonized peat moisture content dropped to 30 wt %. A bench-scale continuous system for the two-phase anaerobic digestion to recover energy and treat the wet carbonization process effluent water was designed, fabricated, assembled, and tested. A base case operating condition was selected from the PRU tests for process design and economic studies. The operating condition selected included a temperature of 395°F, a residence time of 10 minutes, and a feed slurry concentration of 10 wt %. The product peat moisture content was 46 wt % with a calorific value of 9500 Btu/lb (dry basis). For a plant producing 300,000 TPY (dry basis) of wet-carbonized peat, the total plant investment was determined to be about $32 million; the 20-year average cost of the wet-carbonized peat product was $2.18/million Btu. The results of Phase I have shown that thermal beneficiation of peat by the wet carbonization process is technically and economically feasible. IGT recommends that Phase II be initiated and that the optimum operating conditions identified in Phase I for wet carbonization of Minnesota peat be tested in the PRU.

38694 **(DOE/PC/60787—7) Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 7, April 1-June 30, 1985.** Crynes, B.L.; Seapan, M. (Oklahoma State Univ., Stillwater (USA). School of Chemical Engineering). 16 Jul 1985. Contract FG22-83PC60787. 16p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014721.

Further analyses of the liquid products and catalyst samples of runs CZA-CZF were completed. Experimental conditions of these runs were 400°C (752°F), 10.3 MPa (1500 psig) and a liquid volume hourly space time of 1.9 h. The catalysts were equally divided between the two zones. The overall reproducibility of this experimental study was documented in runs CZA and CZF, meant to be replicates, in that their nitrogen removal and H to C atomic ratios were similar. The ASTM D-1160 vacuum distillations of representative liquid products revealed that the Ni-Mo and Co-Mo catalysts produced higher hydrocracking activities than did the Ni-W catalyst. Coke contents of spent catalysts range from 20 to 27 weight percent, and generally more coke was present in the top zone of the reactors. The three catalyst types had similar coke contents. Upon oxidative regeneration, from 85 to 93 percent of the original pore volumes and surface areas were recovered. The Ni-W catalyst showed the greatest loss of pore volumes and surface areas upon deactivation. Furthermore, this catalyst revealed a lower percent of recovery upon regeneration. 2 figs., 5 tabs.

38695 **(DOE/PC/60797—7) Intermediates formed during supercritical desulfurization of coal. Seventh quarterly technical progress report, January 1-March 31, 1985.** Muchmore, C.B.; Chen, J.W. (Southern Illinois Univ., Carbondale (USA). Dept. of Mechanical Engineering and Energy Processes). 1985. Contract FG22-83PC60797. 3p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014160.

During the past quarter, two analytical instruments in the laboratories of the Department of Mechanical Engineering and Energy Processes have been replaced by newer instruments that have enhanced our capabilities to quantify the reaction products resulting from the supercritical desulfurization of coal with alcohols. The major effort during the month was associated with set-up and standardization of these instruments. Although several batch reactor runs were performed, analyses of the reaction products were not completed during the reporting period due to the equipment change-over, and thus will be reported next quarter. This report discusses the analytical advantages of the new equipment.

38696 **(DOE/PC/60798—7) Catalytic hydrotreatment studies with model compounds. Quarterly report, April 1-June 30, 1985.** Satterfield, C.N.; LaVopa, V. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemical Engineering). 1985. Contract FG22-83PC60798. 19p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014937.

Preliminary studies of the catalytic hydrodeoxygenation (HDO) of dibenzofuran at 360°C and 7 to 14 MPa have revealed new features of this reaction. Surprisingly, over a presulfided Ni-Mo/Al_2O_3 catalyst, as much as 75% of the products are C_6 to C_7 single ring compounds. This behavior is markedly different from the analogous hydrodesulfurization of dibenzothiophene, in which double ring C_{12} products predominate. Differences were also found compared to hydrodenitrogenation reactions since removal of H_2S from the system increased reactivity rather than decreasing it. Higher partial pressures of water enhance the selectivity to isomerization products. The HDO rate is a strong function of hydrogen partial pressure. 2 refs., 11 figs.

38697 **(DOE/PC/70795—T3) Macromolecular chemistry of coalification. Quarterly report, February 1-April 31, 1985.** Larsen, J.W.; Kovac, J.; Shawver, S.E. (Lehigh Univ., Bethlehem, PA (USA). Dept. of Chemistry; Tennessee Univ., Knoxville (USA). Dept. of Chemistry). 22 May 1985. Contract FG22-84PC70795. 10p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014457.

The purpose of this report is to present the results of the extraction studies performed using Illinois No. 6 coal and N-methyl-2-pyrrolidone (NMP). NMP was chosen as a solvent for coal extraction on the basis of its solubility parameter and the strength as a hydrogen bond acceptor. The results of the NMP extractions are listed in Table 1. Also included in Table 1 is the % extraction of Illinois No. 6 with pyridine. Two experimental results observed are noteworthy. The NMP extraction yield is up to 15% greater than that of the pyridine extraction and the number average molecular weight of the NMP extract is approximately one-third of that of the pyridine extract. The most reasonable explanation is some bond breaking, but this is contradicted by the solvent experiments. Either selective bond breaking is occurring or the extraction process is very specific and poorly understood. One difference in the extraction procedure is the temperature of the extraction. The temperature of the coal during a pyridine Soxhlet extraction is 85°C. NMP extractions run at approximately 165°C. Whether the extraction temperature does have an effect on the extraction yield and number average molecular weight of the extract is uncertain. Room temperature extractions with NMP are in progress. 5 refs., 4 tabs.

38698 **(DOE/PC/70801—T4) Thermodynamic properties for supercritical coal conversion. Quarterly progress report, March 21-June 30, 1985.** Eckert, C.A. (Illinois Univ., Urbana (USA). Dept. of Chemical Engineering). 1985. Contract FG22-84PC70801. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014153.

Solubility data are now being taken at higher temperatures and for solvents doped with polar entrainers. The solubility data at the higher temperatures show a similar type of behavior as in the lower temperature solvents. The enhanced solubility that results when a polar entrainer is used in the solvent can be correctly predicted (qualitatively) by considering the specific chemical interactions between the functional groups of the entrainer and functional groups of the solutes. The effect of a supercritical solvent upon reacting systems is now being seen. There seems to be some solvent interaction that affects the kinetic rate of the simple dimerization reaction, but more analysis is needed. The results of the first-order reverse reaction should prove useful in determining the effect. Work has continued to determine a method by which the supercritical phase behavior can be predicted. Refinement of the hard-sphere equations has led to strong correlations of the parameters that have predictive power. Development of the lattice-gas model has led to correlation of real experimental data. Because of the fundamental nature of its construction and parameters, further refinement of the lattice-gas could lead to a very universal, predictive method.

38699 **(DOE/PC/70812—3) Improved catalysts for coal liquefaction. Quarterly report No. 3, March 1-May 31, 1985.** Haynes, H.W. Jr.; Baker, J.R.; McCormick, R.L. (Wyoming Univ., Laramie (USA). Dept. of Chemical Engineering). 27 Jun 1985. Contract FG22-84PC70812. 22p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014156.

Shakedown runs of the bench scale hydrotreating unit were initiated in May. The only serious operational problem experienced was an adherence of viscous product to the walls of the high pressure accumulator. This made it difficult to close a material balance around the unit. New product accumulators [illegible] been designed

which can be removed from the unit and weighed for liquid product yield. The temperature programmed desorption apparatus is proving to be a valuable tool for characterizing surface acidity. An AMOCO exploratory silica-alumina support exhibits a well-defined β-peak indicating a substantial number of acid sites. The β-peak was essentially absent in a silica support, and an alumina support was characterized by a wide poorly resolved β-peak which suggests a wide distribution of acid site strengths. The high acidities reported previously for the hydrotreating catalysts are due to metals loading, and in particular loading with molybdenum. Indications are that the metal sulfides may be less acidic than the oxides. An alumina-aluminum phosphate composite has been prepared in which practically all the pore volume is in pores larger than 5 μm. The coal derived feedstock has been subjected to further analysis by proton and carbon-13 NMR. 7 refs., 10 figs., 4 tabs.

38700 **(DOE/PC/71010—T1) Assessment of experimental techniques for the measurement of bubble size in a bubble slurry reactor as applied to indirect coal liquefaction. Final technical report.** Saxena, S.C. (Saxena (S.C.), Skokie, IL (USA)). Jul 1985. Contract AC22-84PC71010. 147p. NTIS, PC A07/MF A01; GPO Dep. File Number DE85015211.

This report is composed of two parts: (1) indirect liquefaction of coal - Fischer-Tropsch synthesis in slurry bubble column reactors; and (2) an assessment of experimental techniques for the measurement of bubble size in a bubble slurry reactor as applied to indirect coal liquefaction. Each part has been processed separately for inclusion in the Energy Data Base.

38701 (DOE/PC/71010—T1, pp 1-73, Paper 1) **Indirect liquefaction of coal: Fischer-Tropsch synthesis in slurry bubble column reactors. Task 1.** Saxena, S.C. Jul 1985. NTIS, PC A07/MF A01. File Number DE85015211.

In Assessment of experimental techniques for the measurement of bubble size in a bubble slurry reactor as applied to indirect coal liquefaction. Final technical report.

Indirect liquefaction of coal via Fischer-Tropsch synthesis in a slurry bubble column is a viable and promising coal conversion technology for the production of liquid fuels and chemicals from coal. However all process details are not well understood at the present time and it is most often considered as economically unfavorable against the unstable and fluctuating oil prices from the middle east. One view that encourages the development of this technology is that in the optimum mode this process may turn out to be the most attractive way of producing petrochemicals from coal. This has provided the incentive to synthesize all the available information to enable a proper appraisal of our understanding of this process of indirect liquefaction of coal via Fischer-Tropsch Synthesis in a slurry bubble column. This report includes a description and discussion of all such efforts that have been made from time to time in different parts of the world. In particular, the German, American, British, Indian and Japanese efforts are considered. The details of these different initiatives are compared and various agreements and disagreements in their results are pointed out. The areas of particular concern where our understanding is deficient and further research and development work is in order are identified and emphasized. 34 refs., 10 figs., 7 tabs.

38702 (DOE/PC/71010—T1, pp 1-71, Paper 2) **Assessment of experimental techniques for the measurement of bubble size in a bubble slurry reactor as applied to indirect coal liquefaction. Tasks 2 and 3.** Saxena, S.C. Jul 1985. NTIS, PC A07/MF A01. File Number DE85015211.

In Assessment of experimental techniques for the measurement of bubble size in a bubble slurry reactor as applied to indirect coal liquefaction. Final technical report.

The proper design and control of an indirect coal liquefaction process plant requires an accurate knowledge of bubble sizes and size distribution. Of particular importance regarding proper design, is the understanding of the complicated dependence of bubble dynamics column geometry and the nature of the solid-liquid phases. The nature of the products and their relative proportions on the other hand is seriously influenced by the bubbling characteristics of the reactor because the mass transfer behavior and mixing are dependent on the bubble size and velocity distributions. This report deals with the review of the experimental techniques that have been employed to measure the bubble sizes in multiphase reactors. The methods which fall in three different categories viz., the photographic, the optical probe and the electrical conductivity probe, are described in an historical sequence and in each case highlighting their unique features and design details. A general methodology of data analysis in each category is given together with their state-of-the-art technology assessment and finally their relative merits and demerits. 95 refs., 25 figs.

38703 **(EPRI-AP—3662-Vol.1) Coal liquefaction laboratory studies. Volume 1. Two-stage variations - bituminous coal.** Bynum, R.; Carver, J.M.; Gir, S.; Paranjape, A.S.; Rhodes, D.E. (Kerr-McGee Corp., Oklahoma City, OK (USA). Project Engineering Dept.). Jul 1985. 151p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920765.

Laboratory studies were conducted to provide guidance in the selection of process variable levels for the Liquefaction-section of the continuous coal liquefaction bench-scale unit operated at Kerr-McGee Cimarron Facility. Using the results of batch reactor tests made with Illinois No. 6 coal, an empirical correlation was developed to predict the distillate yield from a thermal-liquefaction at 825°F reaction-temperature as a linear function of the reaction-time, recycle resid to MAF coal ratio and the initial hydrogen pressure. Several single-ring and multi-ring organonitrogen compounds were evaluated as liquefaction solvents. Data indicate that basic organonitrogen compounds, saturated or partially saturated, have a more pronounced effect on the conversion results and particularly on toluene-soluble coal conversions, thereby suggesting that the primary driving force for good conversions may be the unshared pair of electrons associated with the nitrogen atom in these compounds. A study of microautoclaves indicated that sufficient mixing of the contents is necessary to obtain good conversions. The THF-soluble coal conversions were studied as a function of the hydrogen donor concentration in the liquid phase. Variations in product work-up procedures could result in significant differences in the observed THF-soluble and/or toluene-soluble results. A direct comparison of data from different sources should be done with caution and should take into consideration the differences between the equipment and product work-up procedures used. 17 figs., 73 tabs.

38704 **(LBL—19694) Regioselective hydrogenation of polynuclear heteroaromatic compounds catalyzed by polymer-supported transition metal complexes: initial rates, mechanism of reduction, model coal liquid experiment, role of p-cresol in rate enhancement of nitrogen ring reduction, catalytic transfer hydrogenation.** Fish, R.H.; Heinemann, H. (Lawrence Berkeley Lab., CA (USA)). Jun 1985. Contract AC03-76SF00098. 25p. (CONF-8504130—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015133.

From 10. annual EPRI contractors' conference on coal liquefaction; Palo Alto, CA, USA (23 Apr 1985).

The research program focused on the utilization of polymer-supported (polystyrene-divinylbenzene, PS-DVB) transition-metal catalysts in the selective catalytic hydrogenation of polynuclear heteroaromatic compounds that are known to be present in coal and coal liquids. We found that the polymer-supported chloro(tristriphenylphosphine)rhodium(I) was the most efficient catalyst for the regiospecific reduction of the nitrogen containing ring in model coal compounds such as quinoline, 5,6 and 7,8-benzoquinoline, and acridine, and in one case, a heteroaromatic sulfur compound, benzothiophene. Interestingly, the polymer-supported rhodium catalyst was more active than the corresponding homogeneous analogue by relative rate factors of 10 to 20 depending on the substrate studied in the reduction. More importantly, a model coal liquid was found to have a relative rate of reduction of quinoline to 1,2,3,4-tetrahydroquinoline (THQ) that was 2.2 times faster than a similar experiment without the coal liquid constituents consisting of pyrene, tetralin, methylnaphthalene, p-cresol, quinoline and 2-methylpyridine. Further experimentation clearly showed that the model coal liquid constituent, p-cresol, was responsible for the relative rate enhancement in the highly regiospecific reduction of quinoline to THQ. Nuclear magnetic resonance spectroscopy (NMR) experiments have given some insight into this rate enhancement phenomena. We also found that 9,10-dihydrophenanthridine was an excellent catalytic transfer hydrogenation reagent in the presence of several homogeneous and polymer-supported transition-metal catalysts

to transfer hydrogen to such acceptors as quinoline and acridine. We also evaluated dihydroquinoline as a hydrogen transfer reagent, since THQ has been used as a donor solvent in coal liquefaction experiments. 15 refs., 4 figs., 2 tabs.

38705 **(SAND—85-0198C) Deactivation of direct coal liquefaction catalysts by carbonaceous deposits.** Stohl, F.V.; Stephens, H.P. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 10p. (CONF-850942—13). NTIS, PC A02/MF A01; GPO Dep. File Number DE85011188.

From 190. American Chemical Society national meeting; Chicago, IL, USA (8 Sep 1985).

The accumulation of carbonaceous deposits on direct coal liquefaction catalysts has long been known to cause significant, rapid deactivation. We have previously shown that greater than 75% of the catalyst hydrogenation activity and 50% of the hydrodesulfurization activity is lost due to carbonaceous deposits within the first few days of coal processing. The objective of the work reported here, which is part of a larger study aimed at extending catalyst life by mitigating the effects of carbonaceous deposits, was to determine the impact of several hydrotreater feed components and distillate cuts on catalyst activity. This work differs from previous studies in that we have not only characterized the catalyst but have also quantitatively measured catalyst activity losses resulting from the contaminants. As a result of this study, we have found that losses of catalyst extrudate hydrogenation activity ranged from 23% for experiments with the lowest boiling fraction to 82% for a high boiling point feed component. Although HDS activity was not affected by the low boiling fraction, a 70% loss resulted from hydrotreating the highest boiling point component. 4 refs., 2 figs., 2 tabs.

38706 **(SAND—85-0254C) Titanium deposition on coal liquefaction catalysts.** Lynch, A.W. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 15p. (CONF-850942—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85008407.

From 190. American Chemical Society national meeting; Chicago, IL, USA (8 Sep 1985).

Deactivation of catalysts in coal liquefaction hydrotreaters has been correlated with the deposition of carbonaceous materials and metals, especially iron and titanium. However, there are questions concerning the origin of the titanium, how it deposits, and the degree of deactivation that it causes. Using a microflow reactor, we contacted Shell 328 catalyst extrudates with hydrogenated creosote oil, with and without about 0.2% titanium porphyrin, one of the many titanium compounds potentially responsible for depositing metal on coal. The experiments were conducted at 350°C, 500 psi hydrogen, and a space velocity of 2 g feed/g catalyst/h. At an age of ~25 g feed/g catalyst the extrudates contained ~4 wt % carbon and, with porphyrin, showed shell progressive poisoning at a loading of ~2% titanium in the anatase form of TiO_2; this is typical of deposition found in catalysts obtained from large scale liquefaction reactors. Catalyst activities determined by model compound reactions indicated little more deactivation due to the titanium when compared with deactivation resulting from deposits of carbonaceous material alone. 29 refs., 6 figs., 2 tabs.

38707 **(SAND—85-0305C) Catalyst deactivation in direct coal liquefaction processes: a quantitative approach to understanding the rate of activity loss.** Stephens, H.P.; Stohl, F.V. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 12p. (CONF-850942—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE85008418.

From 190. American Chemical Society national meeting; Chicago, IL, USA (8 Sep 1985).

Rapid catalyst deactivation is a major economic impediment to the production of liquid fuels by direct coal liquefaction processes. In order to gain a better understanding of the deactivation phenomena and their impact on liquefaction processes, we have developed a quantitative approach for evaluating the modes and the rates of activity loss experienced by catalysts during coal processing. It is currently believed that direct coal liquefaction proceeds primarily by a donor solvent mechanism in which high molecular weight coal molecules are thermally fragmented into lower molecular weight free radicals, which subsequently abstract hydrogen from polynuclear hydroaromatic compounds in the process solvent. The resulting dehydrogenated polynuclear aromatic hydrocarbons (PAHs) are catalytically rehydrogenated as a portion of the recycle solvent. We have used measurement of the rate of hydrogenation of pyrene, one PAH found in significant amounts in coal liquefaction solvents, to evaluate the activity of catalyst samples periodically withdrawn from a two-stage liquefaction process. This paper describes how kinetic measurements, using pyrene as a probe of activity, have been employed to quantitatively determine the rates of deactivation by two classes of catalyst contaminants, metallic and carbonaceous deposits. 8 refs., 5 figs.

38708 **(BG-Trans—6415) Pressure pyrolysis of coal.** van Heek, K.H. Translated from *VDI-(Verein Deutscher Ingenieure) Forschungsheft ;* No. 612, vp(1982). 107p. NTIS (US Sales Only), PC A06/MF A01. File Number DE85901482.

During pyrolysis coal is converted into coke, whereby especially between 400 and 1000°C gases, water and tar are liberated. This process forms the basis of carbonization on the one hand, but plays an important role in all processes of thermal coal beneficiation on the other. In modern coal technology pressure is of great importance, as new processes are developed requiring higher system pressures for chemical engineering reasons. The following paper describes systematic investigations on the influence of reaction pressure up to 100 bar on course and products of pyrolysis of different coals in presence of inert and reactive gases. For this purpose different apparatuses have been built up and operated for pressurized pyrolysis experiments under helium, nitrogen and hydrogen. With respect to technical processes coal is heated at different rates ranging from 1 K min (moving bed reactors) up to 10^5 K/min (fluidized and entrained bed reactors). The progress of the reactions dependent on time and temperature has been measured gravimetrically, by continuous analysis of the products and by high-speed photography of the phenomena occurring. The results show the influence of pressure on the characteristics of the coke, the yields of products, and on the kinetics of the formation of coke, tar and gas. They enlarge the present basic knowledge of the nature of coal pyrolysis. Thereby especially interactions in the plastic phase, and secondary reactions of the tar inside the coal particle have been elucidated. Also, new approaches have been developed with respect to the reaction mechanism of the pyrolytic hydrocarbon formation. It is shown by certain examples how the results of the investigations in laboratory scale can be used for the modeling of technical coal pyrolysis and gasification reactors for the production of gas and oil. 67 refs., 65 figs., 15 tabs.

38709 **(DOE/ET/13031—T4-Vol.2-Bk.2) Pipeline gas demonstration plant: Phase I. Record environmental analysis report. Volume II, Book 2.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Sep 1979. Contract AC01-77ET13031. 261p. (FE—2012-077-Vol.2-Bk.2). NTIS, PC A12/MF A01; 1; GPO Dep. File Number DE85015334.

The projected major impacts associated with the construction and operation of a coal gasification plant on the Perry County site are summarized. There are three major impacts associated with the project. One is the daily conversion of approximately 2330 tons of coal into 24.0 MM SCFD of SPG. The COGAS process converts high-sulfur and other varieties of coal to SPG. When combusted, this gas produces fewer air pollutants than either oil or coal. This is one beneficial impact of the project. The second beneficial impact of the project is on employment and the economy of the twelve county region. A significant number of jobs for local construction workers will be generated over the 34-month construction period. During Plant operation, approximately 415 jobs will be created. These added employment opportunities will result in the dispersal of a significant amount of revenue within the twelve county region. In addition to the employment and revenues generated as a direct result of Plant construction and operation, induced or secondary jobs and revenues will develop in the twelve county region. Secondary jobs will further reduce the unemployment rate in the twelve counties. Atmospheric emissions will be produced during construction and operation. Construction activities will produce emissions from vehicular traffic, earthmoving, and combustion of debris. The quantities of air pollutants produced during operation of the Plant are summarized in Table 4.3.1-1. The

quantities of atmospheric emissions, during construction and operation, meet the most stringent requirements of the USEPA.

38710 **(DOE/ET/13031—T4-Vol.2-Bk.1) Pipeline gas demonstration plant, Phase I. Record environmental analysis report. Volume II, Book 1.** Eby, R.J. (Illinois Coal Gasification Group, Chicago (USA)). Sep 1979. Contract AC01-77ET13031. 382p. (FE—2012-077-Vol.2-Bk.1). NTIS, PC A17/MF A01; 1; GPO Dep. File Number DE85015325.

The site of the proposed Plant is located in southwestern Illinois, approximately 60 miles southeast of St. Louis in the southwestern corner of Perry County. For each of the environmental parameters (e.g., air or water), it is necessary to delineate the areas of investigation that would be subject to anticipated impacts. With respect to geology and soils, both the site proper and the surrounding region were investigated. Geologic conditions and seismology were investigated for the region, and soils and bedrock for the Plant site. The Mississippi River is the major water body in the area and will be the source of water for the Plant. Water from the river will be transported to the Plant site via a 20-mile pipeline which crosses several small intermittent creeks along its route. The river and creeks crossed by the pipeline are included in the area under study for probable impacts regarding hydrology, water quality, and aquatic biology. Other surface waters included in the study are the large ditches located on and near the Plant site. Groundwater hydrology and water quality studies include Perry County and areas immediately adjacent to it. For terrestrial biology, areas considered for possible impacts include the site and adjacent areas, areas along the pipeline right-of-way, and the intake location on the Mississippi River. The area of investigation for climate and air quality extends well beyond the boundaries of the site because air emissions can be transported many miles from the source. Thus, air quality studies were undertaken throughout the region as well as at the Plant site to determine the extent of probable air quality impacts.

0105 By-products

REFER ALSO TO CITATION(S) 38663, 38804, 38805

0106 Properties

REFER ALSO TO CITATION(S) 38689, 38692, 38739, 38740, 38747, 38750, 38752, 38760, 38761

38711 **(CONF-850942—8) Applicability of standard test methods to the analysis of coal samples for coal research.** Lindahl, P.C. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85010269.

From 190. American Chemical Society national meeting; Chicago, IL, USA (8 Sep 1985).

Standard test methods for routine coal analysis in the United States include those of the American Society for Testing and Materials (ASTM) and, with limited application, those of the International Organization of Standardization (ISO). The former consist of national standards used in the United States and Canada, while the latter have been developed by ISO member nations for international trade. While these methods are used throughout the coal industry and in commerce to establish coal quality, they may not be applicable in the analysis of coal samples for research purposes. One problem area is the chemical analysis of coal. This becomes particularly evident when using ASTM methods which were primarily designed for the analysis of bituminous coal to analyze lignetic and subbituminous coals. Here, researchers and analysts find themselves trying to fit a square peg in a round hole. In this paper some of the difficulties that have been observed in our analysis of research coal samples for major, minor, and trace elements are emphasized, and suggestions for eliminating these problems are presented. 11 refs.

38712 **(DOE/PC/60015—27) Separation and characterization of coal derived components. Report period: 1 April-30 June 1985.** Hurtubise, R.J.; Silver, H.F. (Wyoming Univ., Laramie (USA). Office of Univ. Research). 10 Jul 1985. Contract AC22-83PC60015. 44p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015105.

Several sets of field-ionization mass spectral data are being interpreted. The data are from oils, asphaltenes, and preasphaltenes-1 fractions. Several experiments with preasphaltenes-2 showed that three fractions could be obtained with silica gel chromatographic systems. However, some difficulties were encountered in handling the preasphaltenes-2 material with the chromatographic systems. Several lower molecular weight hydroxyl aromatic structures were characterized in amonohydroxyl aromatic fraction from the oils of F-45. A substantial amount of field-ionization mass spectrometry (FIMS) data and elemental analysis data was obtained from polycyclic aromatic hydrocarbons, nitrogen heterocycles, and hydroxyl aromatics from oils and asphaltenes. However, some of the fractions showed low volatility by FIMS and the carbon content of most of the fractions was low. The low volatility and carbon content are being investigated. The paper in Appendix A, "Estimation of aromatic and hydroaromatic content in complex hydrocarbon samples by liquid chromatography and field-ionization mass spectrometry" was processed separately for inclusion in the Energy Data Base. 7 figs., 3 tabs.

38713 (DOE/PC/60015—27, pp 1-17, Appendix A) **Estimation of aromatic and hydroaromatic content in complex hydrocarbon samples by liquid chromatography and field-ionization mass spectrometry.** 10 Jul 1985. NTIS, PC A03/MF A01. File Number DE85015105.

In Separation and characterization of coal derived components. Report period: 1 April-30 June 1985.

The concept of double bond equivalent was applied to data generated from a liquid chromatography/field ionization mass spectrometry procedure developed previously. The approach allowed a good estimation of the total aromatic and hydroaromatic content in complex hydrocarbon samples. The data were obtained from two high boiling coal liquid samples which performed differently under coal liquefaction conditions. Results of the aromatic/hydroaromatic analysis showed significant differences between the aromatic to hydroaromatic ratios for the two samples. 43 refs., 1 fig., 1 tab.

38714 **(DOE/PC/60803—T5) Thermodynamic behavior of coal liquids in the presence of coal solids characterization of IOM and ASH. Seventh quarterly progress report, March 1-June 1, 1985.** Holder, G.D.; Dempsey, D.M. (Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering). 1985. Contract FG22-83PC60803. 21p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015108.

The major goal of this project is to determine the effect of coal solids (IOM and ASH) on the thermodynamic properties (i.e., vapor pressure) of coal liquids. Presently the interaction of a linear chain molecule with an aromatic is being studied. Three systems of interest are Hexadecane/Tetralin, Decane/Tetralin, and Decane/1-Methylnaphthalene. The binary system of Hexadecane/Tetralin has been studied this past quarter. The P-T and P-X-T diagrams have been included in this report. As part of the data analysis all data have been regressed to fit an Antoine equation of the form: ln P/sub (psia)/ = Al - B1/(C1 + T(K)). The regressed Antoined Constants for the systems studied are included as Appendix II. From the P-X-T diagram it can be seen that the Hexadecane/Tetralin system demonstrates a negative deviation from Raouult's law behavior (dashed line). The system has been modeled using the Peng-Robinson equation of state to represent both the liquid and vapor phases. Preliminary results indicate that this model is unable to accurately describe this system. The universal quasi chemical (UNIQUAC) expression is currently being used to model the liquid phase with the Peng-Robinson equation of state modeling the vapor phase. 4 figs.

38715 **(DOE/PC/70061—4) Polydisperse coal slurry rheology. Quarterly report.** Probstein, R.F. (Massachusetts Inst. of Tech., Cambridge (USA)). Jul 1985. Contract FG22-84PC70061. 9p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014422.

The objective of the program is to develop a theory to predict the rheological characteristics (viscosity) of highly loaded, stabilized coal-water slurries over a wide range of shear rates from those typical for pumping (100 sec^{-1}) to those typical of atomization (20,000 sec^{-1}) in order to enable the optimum design of systems employing such slurries as alternate fuels. The scope of work

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is to perform an analysis in which a stabilized polydisperse pulverized coal slurry is modeled as made up of two relatively distinct particle fractions - a coarse fraction and a smaller fine fraction. Accomplishments to date are: Relative bimodal character of dense coal-water slurries is borne out. Simplified purely bimodal model shows that the particle sizes separating coarse and fine volume fractions in six different slurries are between 2 and 8 microns, even though the particle diameters in the slurries range from 0.5 to 300 microns. Large particles govern level of slurry viscosity at low shear rates. If the maximum packing fraction is modified to account for a continuous particle size distribution, indications are that the separating diameter range is likely to be narrower. 4 refs., 2 figs., 2 tabs.

38716 (DOE/PC/70771—T1, pp 3.1-3.41) **Sorbent sulfation kinetics (MIT).** 1985. NTIS, PC A05/MF A01. File Number DE85014943.

In Kinetics of sulfur and nitrogen reactions in combustion systems. Quarterly report No. 1.

Attempts to use dielectric property measurements of the absorbents led to the following conclusions: (1) dielectric losses and dielectric constants of powder sorbent materials can be measured directly. We are reasonably sure that data are accurate; (2) a linear relationship between log K_2 and log f as required theoretically was obtained. For large particles, the slope of the correlation line was indeed "-1" as required by theory. For small particles, the slope deviates from "-1". The deviation however can be explained through the concept of "restricted conduction path." The equation can be modified accordingly; (3) the samples were found to be constantly changing, probably due to grain growth, which did occur continuously under high temperature conditions; (4) because a steady state of the sorbent can not be obtained, the dielectric measurements can not be used to determine any particular ionic migration such as 0/ sup =/ migration. However, there is a potential to use dielectric measurements to monitor the progress of grain growth. Detailed study of the rate of grain growth is rather difficult to do at any present time; and (5) dielectric measurements may be very useful to study the effect of dopants. If one dopant causes a more significant increase in the point defects population in sorbent crystallites than another, it is anticipated to cause a more significant increase in the dielectric loss measurements. We shall pursue this line of investigation in the future.

38717 **(DOE/PC/70773—2) Macromolecular structure of low rank coals and lignites. Report period: March 1, 1985-June 1, 1985.** Baskar, A.J.; Larsen, J.W.; Wei, Y. (Lehigh Univ., Bethlehem, PA (USA). Dept. of Chemistry). 24 Jun 1985. Contract FG22-84PC70773. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014438.

The objective is to investigate and quantitatively characterize the covalent and hydrogen bond cross links in sub-bituminous coals and lignites and to determine how they change with coal rank. Diffuse reflectance infrared Fourier transform (DRIFT) spectroscopy shows great promise for applications in the quantification of hydrogen bonded species in coal. Spectra collected in the diffuse reflectance mode are superior to standard transmission spectra of KBr discs as evidenced by their non-sloping baseline and general reproducibility. The sampling techniques in DRIFT offer greater flexibility in the study of adsorbed species on coal because of the possibility of greater interaction with the powdered sample. Equipment has been ordered to facilitate the study of hydrogen bonded species in coal using DRIFT. Preliminary results were obtained in air, yielding qualitative results that support the use of DRIFT in quantitative studies of hydrogen bonded species in coal. 4 refs., 5 figs.

38718 **(DOE/PC/70793—T3) Application of the reference intensity method to coal analysis. Quarterly report, 1 April 1985-30 June 1985.** Davis, B.L. (South Dakota School of Mines and Technology, Rapid City (USA). Inst. of Atmospheric Sciences). 1985. Contract FG22-84PC70793. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85013947.

The major effort in reference constant analysis during this period included the source clay samples received from the Clay Mineral Society. We received three samples of smectite/montmorillonite, two samples of kaolinite, and one of illite. The analyses for the montmorillonite bearing materials included analyses of the "as is" material, ethylene glycol treated samples, and samples heated to about 400-1/4C. Reference constants were determined for each of these conditions. We are also obtaining reference constant data from a Wyoming montmorillonite and other samples of montmorillonite. The entire set of data will be compiled into a table for presentation in a later report. Most of the 24 Penn State coal samples have now been processed in the sample preparation and analysis procedures being used in this study. The samples were dried, pulverized, suspended onto filters, and analyzed by x-ray transmission and x-ray diffraction both in the dry whole coal form and in the ashed residue form. There has been no detected changes to the GF/C filter occasioned by the ashing process. As a result of the new reference constant and mass absorption measurements obtained for the clays, sulfides, and other materials under this project we have had to update the computer files and streamline the data entry and retrieval process. A small amount of time has thus been expended toward upgrading and updating the computer data handling process.

38719 **(DOE/PC/70809—T2) Microbial screening test for lignite degradation. Quarterly progress report No. 2, April-June 1985.** Yen, T.F. (University of Southern California, Los Angeles (USA)). 1985. Contract FG22-84PC70809. 34p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85014722.

Fractionation of lignite was performed by means of: (1) benzene-methanol followed by aqueous alkaline extraction; and (2) benzene followed by methanol-alkaline extraction. The residue obtained by the latter fractionation was oxidized by means of cupric oxide and separated into methanol soluble fraction and methanol insoluble residue. Methanol-alkaline fraction was further divided into methylene chloride extractable portion and methylene chloride non-extractable portion. Fourier Transform Infrared Spectroscopy (FT-IR) was employed to characterize functional groups present in the raw lignite sample, benzene-methanol fraction, aqueous alkaline fraction, lignite residue, and benzene fraction. FT-IR was also used for the analysis of both methylene chloride extractable and non-extracted portions. The following are some functional groups identified by the spectra of the fractions mentioned above: OH, amide, aromatic, CH, CO, C=C, CH_3, C-CH_3, $SiCH_3$, epoxide, and C-O-C. Both, raw lignite sample and aqueous alkaline fraction produced positive results for P. versicolor growth, whereas benzene-methanol fraction and lignite residue produced negative results. Acclimation of P. versicolor to lignite was accomplished up to 80% lignite and 20% neopeptone and maltose. 10 refs., 9 figs., 6 tabs.

38720 **(ICTIS/RES—06) Coal research projects: properties, conversion and combustion.** (International Energy Agency Coal Research, London (UK)). Apr 1985. 182p. NTIS (US Sales Only), PC A09/MF A01. File Number TI85901867.

This volume contains details of research projects in progress or completed in the last 3 years on properties of coal and related products, coal conversion, and coal combustion. It has been generated from a database of information on current research projects on all aspects of coal science and technology throughout the world. Of the 1398 projects presented, a number will be found in more than one section and many also appear in the companion volumes on 'Exploration, mining and preparation' and 'Supply, transport and the environment'. The projects are presented in the subject groups which are displayed on the Contents page. For each project record, the following information is given where it could be found: ORGANIZATION principally responsible for performing the research; Division, section or department of organisation; Address; Country; Telephone number (not including international code); COLLABORATING ORGANIZATION(S) with their addresses and telephones numbers; Project title; additional information about the project - summary, objectives, etc.; Contract or project number by which the project is identified by the funding body; Research worker(s); Sponsoring organization(s); Funding; and Starting date - completion date. Indexes of research workers, research organizations, sponsors, project numbers and subject, and a list of abbreviations of organizations follow the projects. The subject index is a

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low-cost index obtained by assigning three Coal Data Base Thesaurus terms of each project record.

38721 **Relationship between reflectivity and organic sulfur content of macerals with respect to total organic sulfur content and rank of coals.** Raymond, R. Jr.; Davies, T.D.; Bower, N.W.; Freeman, S.H. (Los Alamos National Lab., NM). *American Association of Petroleum Geologists, Bulletin;* 68: No. 7, 946(Jul 1984). (CONF-8408161—).

From Energy and More in '84; Salt Lake City, UT, USA (27 Aug 1984).

The potential exists for predicting organic sulfur (S_o) contents of specific macerals within a coal based on total S_o content of the coal, rank of the coal, and maximum reflectivity in oil (R_o) of the macerals in question. In the past, determination of S_o content of specific macerals necessitated either a microanalysis technique, such as electron probe microanalysis (EPM) or analysis of maceral separates. Ten coal samples ranging in rank from low volatile to lignite and total S_o content from 0.47 to 4.51 wt.% were studied. Within each of the 10 coals, approximately 100 macerals ranging from the lowest reflecting exinites to the highest reflecting inertinites were analyzed for S_o content (using EPM techniques) and R_o (using petrographic techniques). For each coal, log of maceral S_o content was plotted versus log of maceral R_o, and a linear regression of the data points was performed. On a three-dimensional plot, slopes of the 10 linear regressions were plotted versus the respective coal ranks versus the respective coal total S_o contents. Results indicate that relationships between S_o content and R_o of macerals within a coal are dependent on both the rank and total S_o content of the coal. As total S_o content of a coal equals S_o content of the vitrinite in that coal, the results suggest that predictive relationships exist between maceral S_o content, maceral R_o, coal total S_o content, and coal rank that may allow determination of maceral S_o contests with the need for microanalysis.

0108 Waste Management

REFER ALSO TO CITATION(S) 38693, 38733, 39602

38722 **(EPRI-CS—3862-Vol.2) Arapahoe low-sulfur coal fabric filter pilot plant. Volume 2. Characterization and reverse-gas cleaning tests, October 1980-April 1982. Final report.** Cushing, K.M.; Wilson, R.R. Jr.; Smith, W.B. (Southern Research Inst., Birmingham, AL (USA)). Jul 1985. 225p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920754.

This report describes operations at EPRI's low-sulfur coal Fabric Filter Pilot Plant during the first 19 months following its startup in October 1980. The primary objectives of this operating period were to collect data to characterize the FFPP as a research tool, and to determine the effects of varying some of its basic operating parameters. The major parameters varied included the method of bag cleaning, the concentration of fly ash at the inlet, the length of the filtering period, and the filtering air-to-cloth ratio. The principal criteria of performance were the tubesheet pressure drop and the efficiency of fly ash collection. Major emphasis was on reverse-gas cleaning. Results of tests indicate that the structure and properties of the residual dustcake on the bags are the dominant factors determining pressure drop. Also, a long period of time - perhaps up to a year or longer - appears to be necessary for reverse-gas cleaned baghouses to achieve stable operation in terms of pressure drop. A limited evaluation of shake/deflate cleaning indicated that this alternative offers the potential of lower pressure drop than reverse-gas cleaning. Numerous measurements of inlet and outlet fly ash concentration and particle size distribution showed collection efficiencies usually above 99.99% with reverse-gas cleaning and just slightly less with shake/deflate cleaning.

38723 **(EPRI-CS—4087) Trace element removal by coprecipitation with amorphous iron oxyhydroxide: engineering evaluation. Final report.** Merrill, D.T.; Maroney, P.M.; Parker, D.S. (Brown and Caldwell, Pleasant Hill, CA (USA)). Jul 1985. 257p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920759.

Coprecipitation with iron appears to be technically and economically feasible for arsenic removal, and technically and economically feasible for selenium removal, provided selenium is predominantly in the selenite form. Furthermore, if treatment could be successfully carried out in existing ash ponds instead of conventional treatment equipment, treatment costs could be reduced to approximately $144 per million gallons (3.8 cents/cu m). 41 figs., 120 tabs.

38724 **(PB—81-236119) Proceedings of the joint symposium on stationary combustion NO/sub x/ control. Volume I. NO/sub x/ emission issues and invited papers.** (Environmental Protection Agency, Research Triangle Park, NC (USA). Industrial Environmental Research Lab.). Aug 1981. 99p. (EPA—600/9-81-028a; IERL-RTP—1083a; CONF-8010379—Vol.1). NTIS, PC A05/MF A01. File Number TI85901488.

From Joint symposium on stationary combustion NOx control; Denver, CO, USA (6 Oct 1980).

The proceedings document the approximately 50 presentations made during the symposium, October 6-9, 1980, in Denver, CO. The symposium was sponsored by the Combustion Research Branch of EPA's Industrial Environmental Research Laboratory, Research Triangle Park, NC, and the Electric Power Research Institute (EPRI), Palo Alto, CA. Main topics included utility boiler field tests; NO/sub x/ flue gas treatment; advanced combustion processes; environmental assessments; industrial, commercial, and residential combustion sources; and fundamental combustion research. This volume discusses NO/sub x/ emission issues and contains specially invited papers.

38725 **(PB—85-174944/XAB) Modeling the performance of sediment detention pond. Volume 1. The CSTRS (continuous stirred tank reactors in series) model based on simple reactor theory. Final report.** Wilson, B.N.; Barfield, B.J.; Warner, R.C. (Kentucky Univ., Lexington (USA). Inst. for Mining and Minerals Research). Dec 1983. 86p. (IMMR—84-093). NTIS, PC A05/MF A01.

Sponsored by Kentucky Energy Cabinet, Lexington.

A conceptual model of detention ponds was developed based on the concepts of continuous stirred tank reactors in series (CSTRS), in which the pond was visualized as a series of completely mixed tank reactors. Mixing between inflow plugs and previously stored flow was allowed in the model. Approximate detention times for sediment particles was estimated by a sophisticated bookkeeping scheme, which accounted for mixing between slugs. Sediment deposition was calculated by conducting a mass balance in eight layers of the pond. Stokes equation was used to determine the settling velocity of sediment particles. The sediment detention pond models were evaluated using the results of six tests on a pilot-scale sediment basin. A comparison between observed results and predicted results was made using a plug flow model (DEPOSITS) and the CSTRS model. Average trap efficiency was predicted very well with both models. Predictions with DEPOSITS, however, poorly estimated the timing and shape of the observed sediment graph. The CSTRS model predicted the shape of this sediment graph quite well.

38726 **(PB—85-183580/XAB) Brown coal fly ash in soil stabilization.** Pachowski, J. (Polish Ministry of Transport, Warsaw. Road and Bridge Research Inst.). Oct 1984. 85p. NTIS, PC A05/MF A01.

This report covers: (1) An investigation of the physical and mechanical characteristics of mixtures of cohesionless soils, sand or sand-gravel aggregate, and Group II fly ash treated with lime or Group III fly ash. (2) A discussion of the characteristics of the materials used. (3) Also included are: (a) test results of specimens cured at various temperatures; (b) observations on test sections of pavements; and (c) guidelines for the construction of road base courses using Group II and Group III fly ash.

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 38667, 38668, 38669, 38670, 38709, 38733

38727 **(DOE/NBM—5014898) Ecological research program in advanced energy technologies: coal synthetic fuels. Summary of major issues and scientific research elements.** Wobber, F.J. (USDOE Office of Energy Research, Washington, DC. Ecological Research Div.). Sep 1982. 86p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85014898.

This program statement provides an overview of ecological research with emphasis on coal synthetic fuels. Information is presented about the concerns that motivate ecological research related to coal synthetic fuels, descriptions of ecosystems at potential risk, and sources of potential exposure to ecosystems. Six major research areas are summarized: terrestrial effects of atmospheric releases; environmental effects of energy-related solid wastes; wastewater and aquatic effect; environmental effects of complex organics; cumulative ecological effects in regions of energy activity, including coal synthetic fuels activity; and bioavailability and food chain transfer of residuals. (ACR)

38728 **(PB—85-178929/XAB) Geochemical properties of coal wastes and the toxicological effects on aquatic life. Environmental geology notes.** Roy, W.R.; Krapac, I.G.; Griffin, R.A.; Dickerson, D.R.; Schuller, R.M. (Illinois Inst. of Natural Resources, Champaign (USA). State Geological Survey Div.). 1984. 138p. NTIS, PC A07/MF A01.

Leachates from solid wastes generated by coal mining, cleaning, and gasification are potentially harmful to the environment. The toxicological effects of leachates on aquatic organisms have not been adequately assessed. In this investigation, samples of seven coal-related wastes were charcterized chemically and mineralogically. Laboratory extracts of each sample, obtained by a variety of extraction methods, were used in both acute and chronic bioassay. A coal-slurry sample (coarse fraction) and two samples of coal-cleaning refuse were chemically and mineralogically similar; they generated acidic water-waste systems, both in the laboratory and in the field. Two mine-spoil samples, essentially shale, tended to generate water-waste systems that were neutral in pH; consequently, they released lower quantities of potential pollutants than the acidic wastes. Each extract was tested for acute toxicity with four species of fresh-water aquatic organisms; the green sunfish (Lepomis cyanellus), the fathead minnow, (Pimephales promelas), a crustacean (Daphia magna), and a snail (Physa anatina). The extracts of the two mine spoil samples and of the gasification residue were not toxic to any of the organisms; whereas the extracts from the acidic refuse and slurry samples were acutely toxic to all the organisms.

38729 **(PB—85-185411/XAB) Dispersion of airborne particulates in surface coal mines: data analysis.** (TRC Environmental Consultants, Inc., Englewood, CO (USA)). Jan 1985. 80p. NTIS, PC A05/MF A01.

This report summarizes the results of an effort to better understand the dispersion and transport of particulate matter released within surface coal-mine pits. Data previously collected at four surface coal mines were used in this investigation. This report describes the analysis and interpretation of those data, examines the relationship between meteorology and smoke puff behavior, and compares mine pit escape fraction (that portion of the dust emitted in the pit that leaves the pit) with those predicted by existing equations. Two independent techniques were used in conjunction with assumed particle-size distributions and the onsite data, to infer values of escape fraction. These values were then used to determine the predictive ability of two widely used model algorithms. The report contains numerous tabulations and discusses the relative merits of each method.

38730 **(PB—85-185742/XAB) Feasibility of a machine-mounted scrubber system for ventilating coal-mine working faces. Open File report.** Halfinger, G. (Ingersoll-Rand Research, Inc., Princeton, NJ (USA)). Jun 1984. 117p. NTIS, PC A06/MF A01.

Underground testing was carried out to determine the effectiveness of a machine-mounted scrubber system for ventilating the face during deep cutting. A continuous miner equipped with an integral flooded-bed dust scrubber system was instrumented. Methane and respirable dust data were collected at brattice setbacks of 25 ft (standard), 35 ft, and 50 ft (blowing ventilation) during production shifts.

0110 Reserves And Exploration

REFER ALSO TO CITATION(S) 38679

38731 **(ICTIS/RES—05) Coal research projects: Exploration, mining and preparation.** (International Energy Agency Coal Research, London (UK)). Apr 1985. 168p. NTIS (US Sales Only), PC A08/MF A01. File Number TI85901868.

IEA Coal Research was established by the International Energy Agency (IEA) which was itself founded in 1974 by member countries of the Organisation for Economic Co-operation and Development (OECD). The purpose of the IEA is to explore means by which countries interested in minimising their dependence on imported oil can co-operate. In the field of Research, Development and Demonstration over fifty individual projects have been established in partnership between member countries of the IEA. IEA Coal Research, set up in 1975 and currently supported by fifteen countries, covers projects on coal information and assessment. IEA Coal Research: maintains bibliographic data bases on coal technology, coal resources, and coal research projects, worldwide; maintains source data bases on coal resources and coal transport; is developing additional data bases including one on forthcoming events of interest to the coal industry; publishes the serials 'Coal Abstracts' and 'Coal Calendar' which provide information on new publications and coal-related meetings and courses; produces technical reviews of the literature on all aspects of coal science, technology and environmental matters; produces, as published reports and internal working papers, economic analyses on aspects of coal supply, trade, end uses, utilization technology and environmental controls; and publishes reference works on coal resources.

0120 Mining

REFER ALSO TO CITATION(S) 38731, 39786

38732 **(DOE/PC/72268—5) Investigation of the Virginia coal industry. Final technical report, May 1, 1984-April 30, 1985.** Hibbard, W.R. Jr.; Chisholm, R.H.; Valdes, R.M. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Virginia Center for Coal and Energy Research). 15 Jul 1985. Contract FG22-84PC72268. 149p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE85015592.

The Virginia coal industry was studied in the context of the Central Appalachian coal markets and competitive coal sources from eastern Kentucky and West Virginia. Production, transportation, and marketing were evaluated, focusing on delivered cost to the user as the key issue in sales. The study concentrated on steam coal sales to Virginia utilities because detailed data were available. The study concludes that since coal quality from all three states is similar, then delivered cost is the key to steam coal sales to Virginia electric utilities. Coal from eastern Kentucky and West Virginia was provided at a lower delivered cost than coal from Virginia. Coal from eastern Kentucky had the lowest FOB mine price, and coal from West Virginia was moved at the lowest transportation costs. Since coal from Virginia had a weighted-average FOB mine cost lower than that from West Virginia, its present disadvantage is in its higher transportation costs. All of the mines involved in the study are served by a single railroad system, and all of the utility plants involved are served by a single railroad system. Lowest transportation costs resulted if the mine and the utility were served by the same rail system. An extra $2 to $3 a ton was required to move the coal 6 to 7 miles to the utility on a second system, as in the case of the Norfolk Southern (NS) switch to the CSX system in Chesterfield. Since the coal producers do not have the margins to absorb this additional cost, the coal delivery competition is between railroads who do. The Virginia coal industry's future is tied inescapably to NS, which transports its coal and determines the delivered costs. Future growth requires that NS meet CSX transporta-

tion competition costs in order that Virginia coal can compete with West Virginia and eastern Kentucky coal on the basis of delivered cost. Increased Virginia coal sales require the close cooperation of Virginia coal suppliers, transporters, and users. 5 figs., 91 tabs.

38733 **(ICTIS/RES—07) Coal research projects: supply, transport and the environment.** (IEA Coal Research, London (UK). Technical Information Service). Apr 1985. 103p. NTIS (US Sales Only), PC A06/MF A01. File Number TI85901866.

This volume contains details of research projects in progress or completed in the last 3 years on coal economics and energy policy, coal handling and transport, environmental aspects and health and safety. It has been generated from a database of information on current projects on all aspects of coal science and technology throughout the world. Of the 740 projects presented, a number will be found in more than one section and many also appear in the companion volumes on 'Exploration, mining and preparation' and 'Properties, conversion and combustion'. The projects are presented in the subject groups which are displayed on the Contents page. For each project record, the following information is given where it could be found: Organization principally responsible for formating the research; Division, section or department of organization; Address; Country; Telephone number (not including international code); Collaborating organizations with their addresses and telephone numbers; Project title; Additional information about the project - summary, objectives, etc.; Contract or project number by which the project is identified by the funding body; Research worker(s); Sponsoring organizations; funding; and Starting date - completion date. Indexes of research workers, research organizations, sponsors, project numbers and subject, and a list of abbreviations of organizations follow the projects.

38734 **(LA-UR—85-1637) Current technology and recent innovative methods in drilled shaft construction.** Neudecker, J.W. Jr. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 7p. (CONF-850997—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012649.

From International symposium on mining technology and science; Xuzhou, China (18 Sep 1985).

Current shaft construction technology is reviewed. Examples are presented of modern shaft construction and excavation machines and how they are operated. Optimization of performance using computer control is discussed, as are also new developments in instrumentation measurements while drilling. Directional control methods are described. Innovative methods of shaft construction and ongoing research and development efforts are described. 5 figs.

38735 **(NP—5901713) Coal mining in Wyoming.** (Wyoming State Highway Dept., Cheyenne (USA)). Jan 1984. 181p. Wyoming Highway Dept., Billing Section, Box 1708, Cheyenne, WY 82002 $10.00. File Number TI85901713.

The idea of the map report "Coal Mining in Wyoming," originated in the Planning Branch of the Wyoming State Highway Department as a planning aid which could be used in analyzing coal mining impact upon the state's highways. With the help of the Wyoming Geological Survey, the idea was expanded to include the data which should be of value to anyone using coal mining information. This second edition also includes geological data. The report includes both those mines with approved mining permits and those which have been determined by the authors to be in a likely position of approval. A site specific map drawn to an approximate scale of 1" = 1 mile has been included for each existing coal mine. The area outlined on each of these maps is defined as that area which is under the control of the mining company. Some mining areas have overlapping boundaries. These are not errors but are the result of agreements between various entities. Every effort has been extended to be as accurate as possible, however, caution should be exercised in the application of these maps.

38736 **(PB—85-185775/XAB) Standardization of controls for roof-bolter machines: Executive Summary. Volume 1. Open File report.** Conway, E.J.; Elliott, W.W.; Curtin, R. (Canyon Research Group, Inc., Westlake Village, CA (USA)). Oct 1983. 22p. NTIS, PC A02/MF A01.

See also PB83-119149 and PB85-185783.

The objective of this study is to propose standardized arrangements for controls in roof bolters. Roof bolting is the most dangerous work in underground coal mines. It is expected that standardized control arrangements would increase safety, minimize training requirements, and promote productivity. This report provides a human factors analysis of roof bolter controls. Standards for control design are suggested. These include the adoption of design criteria such as functional grouping of controls; sequencing controls according to order of operation; standardizing control motion directions; and standardizing actuation force requirements, control sizes, and interspacing. The proposed control arrangements were reviewed by roof bolter manufacturerers and MSHA roof control experts; the responses were favorable. Detail designs for the proposed standardized controls were developed.

38737 **(PB—85-185783/XAB) Standardization of controls for roof-bolter machines. Volume 2. Open File report.** Conway, E.J.; Elliott, W.W.; Curtin, R. (Canyon Research Group, Inc., Westlake Village, CA (USA)). Apr 1983. 88p. NTIS, PC A05/MF A01.

See also PB85-185775.

The objective of this study is to propose standardized arrangements for controls in roof bolters. Roof bolting is the most dangerous work in underground coal mines. It is expected that standardized control arrangements would increase safety, minimize training requirements, and promote productivity. This report provides a human factors analysis of roof bolter controls. Standards for control design are suggested. These include the adoption of design criteria such as functional grouping of controls; sequencing controls according to order of operation; standardizing control motion directions; and standardizing actuation force requirements, control sizes, and interspacing. The proposed control arrangements were reviewed by roof bolter manufacturers and MSHA roof control experts; the responses were favorable. Detail designs for the proposed standardized controls were developed.

38738 **(UNC-WRRI—214) Hydrologic and water quality impacts of peat mining in North Carolina.** Gregory, J.D.; Skaggs, R.W.; Broadhead, R.G.; Culbreath, R.H.; Bailey, J.R.; Foutz, T.L. (North Carolina State Univ., Raleigh (USA)). Aug 1984. 238p. (NC/CEIP—41). North Carolina State Univ., 225 Page Hall, Box 7912, Raleigh, NC $8.00. File Number TI85901851.

The surface and subsurface hydrologic impacts of peat mining were studied at a pocosin site in the lower coastal plain of northeastern North Carolina. Runoff and water quality data were collected for discharge from field ditches draining sites being actively mined and sites with natural vegetation. A water management model (DRAINMOD) was adapted to simulate surface hydrology. The finite element method was used to evaluate the effects of peat mining on vertical seepage to a deep aquifer and lateral seepage from a nearby lake. Volume, duration, and peak flow of storm discharge from field ditches was greater from the mining sites than from those having natural vegetation. Baseflow between storm events was greater from vegetated sites than from the mined sites. Reduced evapotranspiration, reduced infiltration capacity and grading and sloping of the surface are most likely responsible for those differences. Relatively high concentrations of organic sediment in field ditch outflows resulted from the highly erodible state of the mined surface and the field ditch channels. However, much of the sediment load settled in the weir stilling ponds and concentrations decreased downstream in collector and main channels due to setting and dilution. Concentrations of nitrogen and phosphorus varied little among sampling sites but were considerably higher than those reported in outflow from similar sites with natural vegetation in several other studies. Mining appeared to have no significant impact on concentrations of K, Ca, Mg, and Cl in outflows. 93 figs., 31 tabs.

0130 Transport And Handling

REFER ALSO TO CITATION(S) 38715, 38731, 38733, 38768, 39714

38739 (BNL—36514) Study of the effects of additives on coal-water mixture atomization. Krishna, C.R.; Sapienza, R.S. (Brookhaven National Lab., Upton, NY (USA)). Apr 1985. Contract AC02-76CH00016. 15p. (CONF-850901—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014828.

From 2. European conference on coal liquid mixtures; London, UK (17 Sep 1985).

The effect of surfactant type additives on the atomization characteristics of water and coal-water mixtures was studied. It was found that a non-ionic surfactant increased the atomized mean droplet size for water while an anionic surfactant did not affect it. Neither of the additives affected the mean drop size of moderately-loaded coal-water mixture tested. This behavior did not correlate with the changes in physical properties such as viscosity and surface tension caused by the addition of the surfactants. 6 refs., 11 figs., 1 tab.

38740 (CONF-850464—2) Comparison of emerging selective agglomeration technologies. Killmeyer, R.P. (USDOE Pittsburgh Energy Technology Center, PA). 1985. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014346.

From Coal preparation conference and exhibition; Lexington, KY, USA (30 Apr 1985).

The objective of this study was to determine the extent of technical advances in the state-of-the-art of ultrafine coal cleaning. The aim was to evaluate the selective agglomeration technologies collectively to see how far they have progressed in their ability to clean fine coal, and to see how the results might differ among processes. The major concern of this study was not the various levels of development or the economics of each particulate process. The study called for DOE to distribute samples of coal to several organizations working on selective agglomeration technologies, for each organization to beneficiate the coal sample using its process, and for the organization to return the samples of clean coal and refuse to DOE for analysis and reporting. This paper describes the processes used by the participating organizations, and the results from each; however, the processes (organizations) will not be identified by name with the results. This method of reporting the data was chosen to encourage participation without risk, to develop a spirit of cooperation, and to eliminate the competitive aspect of such a comparison. It should be noted that the organizations agreed to participate without reimbursement for their efforts. 1 fig., 4 tabs.

38741 (DOE/OR/00033—T99) Effect of surfactant washing on enhanced dewatering of fine coal. Binkley, T.O. (Oak Ridge Associated Universities, Inc., TN (USA)). 1985. Contract AC05-76OR00033. 216p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE85015012.

The final moisture content of fine coal filter cakes in coal preparation plants is determined by the filtration and dewatering process. Washing the coal filter cake with a surfactant solution is a potentially economical technique to reduce the final moisture in a fine coal filter cake. The microscopic structure of the porous coal filter cake determines the relative permeability, porosity and final moisture content of the coal filter cake. An experimental study of washing fine coal filter cakes formed from coal-water slurries was conducted. The effect of surfactants on the structure of fine coal filter cakes and the final moisture of these filter cakes was investigated. The filter cake structure was determined using the Cahn and Fullman section chord method. This micrographic technique of quantitative stereology utilized an optical microscope and an image analyzer to measure particle and pore sizes. The washing phenomena using Triton X-114 and Aerosol-OT was investigated to determine the ability of surfactants to enhance the dewatering of fine coal. A significant reduction in final moisture content was achieved by washing the filter cake with a 100 ppM Aerosol-OT solution. While Triton X-114 can also produce a significant reduction in the final moisture content in a filter cake, the amount of surfactant adsorbed from the wash liquor onto the coal in the filter cake was, however, more than Aerosol-OT. Wash ratios of ten gave optimum results for both types of surfactants. The effects of washing on particle and pore size distributions in the coal filter cake were analyzed by micrographic measurement. The mean size of the particles and pores was used to correlate the washing results. Comparisons were made between double distilled water filter cakes and double distilled water filter cakes washed with either double distilled water or surfactant solutions. Experimental results are discussed. 25 refs., 68 figs., 32 tabs.

38742 (DOE/PC/10339—T1) Coal-fluid properties study. Final report. Klinzing, G.E. (Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering). Sep 1979. Contract AC22-79PC10339. 77p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85014946.

This study on coal-fluid properties covered the areas of pneumatic conveying of coal and instrumentation as well as the topic of coal-oil mixture stability and sedimentation. The results are presented in three sections: Dense Phase Pneumatic Transfer, Pressure Losses in Bends and Curves, and Coal-Oil Mixture Stability and Sedimentation. One of the major contributions for this study is the establishment of guidelines for design of dense phase pneumatic transfer. A frictional representation for the solids effects in two phase flow has been developed. Another accomplishment is design recommendations on how to handle curves and bends for prediction of energy losses in gas-solid transport. The final development is the application of continuity wave theory to the description of sedimentation in coal-oil mixtures. In addition a criteria has been suggested for defining the stability of coal-oil mixtures. Three sections have been entered individually into EDB and ERA. (LTN)

38743 (DOE/PC/10339—T1, pp 2-11) Analysis of dense phase gas-solid flow. Sep 1979. NTIS, PC A05/MF A01. File Number DE85014946.

In Coal-fluid properties study. Final report.

Several models have been tested on experimental data for dense phase pressure losses in tubes for vertical gas-solid flow. Classification of dense phase was made by a definition involving the pressure drop versus gas velocity curve or when not available for loadings greater than 10. Of the existing models the Konno-Saito gave the best representation of the experimental data. A multiple regression analysis of the data produced a model which has a larger index of determination than the Konno-Saito model. This final model is recommended for design of dense phase systems at this time. 13 refs., 2 figs.

38744 (DOE/PC/10339—T1, pp 12-29) Analysis of pressure losses in bends for gas-solid flow. Sep 1979. NTIS, PC A05/MF A01. File Number DE85014946.

In Coal-fluid properties study. Final report.

An analysis has been performed on the available data and correlations in the literature of measurements and predictions of the pressure losses in bends for gas-solid flow. A number of models have been proposed: Schuchart, Ikemori and Munakata and Morikawa, et al. These investigators have compiled data as well as Mason and Smith and Sproson et al on pressure losses in bends for gas-solid flow. In addition to these analyses, the use of acceleration losses and a simplified design comparison with single phase flow have been considered as approximate models for pressure losses in bends. The final recommendation is that the Schuchart model works best; however, for fine powders <70 μm in diameter significant deviations from Schuchart's model are found. 9 refs., 4 figs.

38745 (DOE/PC/10339—T1, pp 30-75) Analysis of coal-oil mixture sedimentation by continuity wave theory. Sep 1979. NTIS, PC A05/MF A01. File Number DE85014946.

In Coal-fluid properties study. Final report.

Coal-oil mixtures which have the potential to stretch oil usages have been analyzed as to their sedimentation behavior by applying the continuity wave theory as developed by Kynch. Three coal-oil systems have been studied and shown to follow the continuity wave theory by assigning a degree of agglomeration to the coal particles. With the presence of surfactants the sedimentation of the mixtures could be similarly analyzed. The general effect of particle size of the coal and temperature of the system have been considered and presented as guidelines for design.

38746 (DOE/PC/10339—T2) Coal-fluid properties study for DOE. Progress report. Klinzing, G.E. (Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering). [1985]. Contract AC22-79PC10339. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014950.

The research work on coal-fluid properties has two aspects; one dealing with pneumatic transport of coal under dense phase conditions and the other concerning the stability of coal-oil mixtures (COM). For pneumatic transport of coal a recommended design procedure for calculation of the pressure drop has been developed. A tentative technique for accounting for energy losses through bends is suggested. The test facility for the pneumatic transfer study is awaiting delivery of the solid screw feeder for completion of the unit and testing of the various flow measuring devices. The COM analysis of existing data shows a common behavior of the settling rates. Some correlations with the asphaltene content of the oil is possible. Additional testing is suggested for confirmation of the settling behavior. 16 refs., 4 figs.

38747 (DOE/PC/50270—T11) Coal water mixture development. Quarterly technical progress report. (TRW Space and Technology Group, Redondo Beach, CA (USA)). 12 Jul 1985. Contract AC22-82PC50270. 12p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015550.

The 2000 hour equipment testing phase of the Plant Equipment Selection and Performance Project was completed early June. The final 918 hours of testing were accomplished as 13 separate runs during this quarterly performance period. The testing included runs utilizing both the progressive cavity and the twin screw pumps in burner service. The CWM utilized in the performance of these runs was from a 65,000 gallon production initially generated in August 1984. It is significant that the flow properties of this CWM remained essentially constant for almost one year in long term storage at the Vendor's facility, in transport from the east to the west coast, and in short term storage at TRW. However, it is not known whether the slurry will remain unchanged when utilized for the radio assay corrosion/erosion test scheduled for July and August. The data reported reveals the effect of differences in pumps on the stability properties of the CWM being circulated. Slurry from the first shipment was utilized to test the performance of the test loop equipment using the progressive cavity burner pump. No change in viscosity after 100 hours of circulation was apparent. Slurry from the second shipment was utilized in testing involving the twin screw burner pump, and viscosity increase of over 500% in <70 hours was evidenced. Slurry fom the third delivery was utilized in testing with both pumps and the previous effects were confirmed. The plans for the next quarter include the installation of a radio assay corrosion/erosion monitoring device to generate data for determining materials loss due to CWM service in pipe elbows and tees. An additional testing period of 200 hours is planned. 1 tab.

38748 (DOE/PC/60806—T3) Preparation of super-clean coal: Zeta potential measurements on miocrobubbles generated using various surfactants. Technical progress report, September 15, 1984-March 14, 1985. Yoon, R.H.; Adel, G.T.; Yordan, J.L. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Mining and Minerals Engineering). 1985. Contract FG22-83PC60806. 44p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85012998.

The zeta potentials of microbubbles in the 40- to 80-micron size range have been determined by means of a simple microelectrophoresis technique. In general, the bubble charge is determined by the charge of the polar head of the surfactants when ionic surfactants are used to produce the bubbles. However, the magnitude of the zeta potentials is reduced when the surfactants are hydrolyzed. When using nonionic surfactants, the bubbles exhibit isoelectric points (i.e.p.) in acidic and neutral pH ranges. It appears that the location of an i.e.p. is determined by the acid-base property of the surfactant molecule used. The negative charges observed with air bubbles and oil droplets in the absence of surfactants can be explained by the differences in the hydration energies of H^+ and OH^- ions. An increase in the concentration of ionic surfactants results in an increase in bubble charge. However, the increase is minimal or non-existant when nonionic surfactants are used. 16 refs., 16 figs., 1 tab.

38749 (DOE/PC/70057—T3) Dilute, dense-phase and maximum solid-gas transport. Third quarterly report. Gidaspow, D. (Illinois Inst. of Tech., Chicago (USA). Dept. of Chemical Engineering). Jul 1985. Contract FG22-84PC70057. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015120.

A multiparticle size, transient, two-dimensional computer program was developed that has the potential of predicting flow behavior in all flow regimes including hopper flow, fluidization, dense and dilute pneumatic transport with a minimum of empirical input. For single particle size flow the input consists of well known drag correlations and of solids viscosities and stresses that must be supplied from experiments. For multisize particle flow, particle to particle force correlations must also be supplied to predict correct segregation. The computer model was used to predict solid, gas and porosity profiles for steady two dimensional flow in a vertical pipe for several solids viscosities. The correct solids viscosities will be obtained from experimental radial profile measurements in progress. The prediction of maximum solid-gas transport is needed in many coal feeding systems. Several mathematical models were studied to determine such critical multiphase flow. It was found that dense-phase transport may be limited by a critical velocity equal to the square root of an elastic modulus for the powder divided by the powder density.

38750 (DOE/PC/70765—5) Program of basic research on the preparation and stability of coal/water slurries. Quarterly report. Atlas, H.; Casassa, E.Z.; Parfitt, G.D.; Toor, E.W. (Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Chemical Engineering). 30 Jun 1985. Contract FG22-84PC70765. 77p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85015351.

A series of three Lower Kittanning coals freshly ground under air have been characterized as powders and as slurries. The 8.7% ash ROM coal was initially moderately oxidized, the 6.2% ash sample beneficiated from the ROM coal was heavily oxidized, and the 2.3% ash sample, beneficiated from coal mined at an earlier date from the same mine is only slightly oxidized. All three are low in soluble inorganic minerals including iron. There is a four-fold difference in ash content, mainly in the quantity of clay minerals, but the effects of beneficiation on surface chemistry are overshadowed by those attributable to oxidation level. The critical surface tension for wetting in methanol/water mixtures and the wettability in surfactant solutions change only slightly from the highest to the lowest ash coal. However, the electrophoretic mobility of the heavily oxidized 6.2% ash coal is negative throughout the pH range, becoming strongly negative above pH 6. Above that pH the viscosity of this coal is very low and the sedimentation stability is destroyed. In contrast slurries of the very slightly oxidized 2.3% ash beneficiated coal have a positive mobility up to pH 7 while the 8.7% ash ROM coal displays a mobility-pH curve which falls between these two extremes. Thus oxidation of the carbonaceous surface produces a more acid and more negatively charged coal. Four Splash Dam coals aged after grinding for approximately six months under air have also been characterized. Alkali extraction tests indicate little or no surface oxidation of these coals during aging. Critical surface tensions for wetting are almost unchanged. 5 refs., 24 figs., 28 tabs.

38751 (DOE/S—0036-Vol.1) Clean coal use technologies. Volume I. (USDOE Energy Research Advisory Board, Washington, DC. Clean Coal Use Technologies Panel). Jun 1985. 29p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85014760.

This report by the Energy Research Advisory Board (ERAB) Panel on Clean Coal Use Technologies has been prepared in response to a request, dated April 24, 1984 from the Secretary of Energy, Donald Hodel. The conclusions from each subsection are summarized and discussed in the report. Major items are the following: the use of coal during the next quarter century is expected to grow at a slow but steady pace (most of it consumed in utility boilers), with particular emphasis on the continued use of coal in existing installations. Therefore, demonstration of clean use technologies which can be retrofitted warrants special consideration. The Panel notes the wide range of available alternates and concludes that selection of preferred systems will be extremely site specific.

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There is no way to select any one preferred approach by ranking the many different concepts. The factors which can affect the choice at any given site will include plant size, plant life remaining, type and price of available coals, location or space for added equipment, ponds, etc., applicable regulations on emission, and others. Therefore, a proper DOE program should offer a reasonable choice of alternates, leaving selection of technology to the private sector. This selection process by the marketplace will best determine which systems deserve DOE support. The report lists some 13 to 15 categories of technologies for clean coal use and there are numerous competitive approaches available in most of these categories. While most of the funds would be expected to come from the private sector, a contribution by DOE of 30% (50% maximum for individual projects) on average is believed adequate and warranted to assure an expeditious execution of the program. The Panel believes this is necessary to assure the continued viability of the coal option.

38752 **(EPRI-CS—4071) Coal cleaning test facility: 1985 plan.** Torak, E.R.; Parkinson, J.W.; Moorhead, R.G.; Hoffman, N.; Cavalet, J.R.; Bhowmick, A.K.; Akers, D.J.; Jenko, R.J. (Kaiser (Raymond) Engineers, Inc., Homer City, PA (USA); Science Applications International Corp., Homer City, PA (USA)). Jul 1985. 173p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920755.

The activities at EPRI's Coal Cleaning Test Facility (CCTF) are divided into two major categories: a standard suite of tests which define Coal Cleanability Characterization and Development and Demonstration (D and D) projects. EPRI began conducting Coal Cleanability Characterizations on nationally important steam coals in 1983. These characterizations are a series of laboratory and pilot-scale investigations designed to determine a coal's raw-coal characteristics, susceptibility to cleaning by froth flotation techniques, ash and sulfur liberation potential, small coal (-3/4-inch) cleaning performance in a variety of commercial flowsheets, and changes in combustion characteristics resulting from cleaning. Eight coal seams are scheduled for Coal Cleanability Characterization in 1985. D and D projects are designed to expedite commercialization of new and improved coal cleaning technology. One new project, a demonstration of continuous batch weigh feeding, will be undertaken in 1985. This is added to eight other D and D projects begun in prior years. The CCTF 1985 Plan details the CCTF tests and projects planned for 1985. This plan, which describes work to be performed as defined by CCTF and Fuel Quality Program objectives, defines research and development activities for the year while insuring continuity between annual and long-range plans. 36 figs., 42 tabs.

38753 **(EPRI-CS—4084-Vol.1) Coal cleaning by oil agglomeration. Volume 1. An investigation of the process, with oil recovery. Final report.** Nguyen, Y.V. (Ontario Hydro, Toronto (Canada). Research Div.). Jun 1985. 219p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920701.

Bench and pilot scale experiments were carried out to evaluate the spherical oil agglomeration process to clean coal to very low ash levels (less than 1.5%). Seven coals were evaluated on the bench scale at the Canadian National Research Council in Ottawa, Canada and two of the most promising coals were re-evaluated for confirmation on the pilot plant scale in Ontario Hydro's 500 kg/h coal cleaning pilot plant. From this study, it was concluded that to prepare a very low ash coal, the coal must be pre-cleaned by low density separation at 1.30 g/mL followed by very fine grinding to 5 to 6 micron mass median diameter prior to oil agglomeration. After agglomeration at an oil-to-coal ratio of up to 40%, more than 95% of this oil can be recovered by thermal drying at a high temperature (300°C) and a long residence time (50 min). A conceptual design for a 100 Mg/h low ash coal plant using this process was prepared and the total operating, maintenance, and capital amortization cost for a plant located at the generating station was estimated to be $US 42/Mg of product. 22 refs., 60 figs., 34 tabs.

38754 **(IS-M—546) Pressurized electroosmotic dewatering (PED) of fine coal suspensions.** Heath, L.W.; Demirel, T. (Ames Lab., IA (USA)). 1985. Contract W-7405-ENG-82. 28p. (CONF-850354—1). NTIS, PC A03/MF A01; GPO Dep. File Number DE85015521.

From 10. international technical conference on slurry technology; Lake Tahoe, NV, USA (26 Mar 1985).

Current dewatering methods for ultra-fine coal suspensions are inadequate and usually require subsequent expensive thermal drying. This unique dewatering method is based on pressurized electroosmosis, the movement of water by an electrical field through a porous medium, under modest pressure, e.g., 110 psi. More ultra-fine coal can be utilized since an effective dewatering process can be realized by combining known filtration techniques with electroosmosis. The dewatering efficiency can be significantly improved, the residual moisture of the cake can be substantially reduced and handling problems can be eliminated. Bench-scale testing is being used to optimize the parameters which influence pressurized electroosmotic dewatering (PED) of ultra-fine coal suspensions. Particle size distribution is being addressed to obtain a maximum density for a given pressure such that pore saturation is maintained allowing electroosmosis to be effective for a longer period. The parameters under investigation which influence the dewatering rate include pressure (10 to 110 psi), voltage (10 to 50 VDC), current (0.5 to 2 A) and zeta potential (-10 to -75 mV). The zeta potential of the coal suspensions is being controlled using chemical additions of potential-determining ions, polyelectrolytes and surfactants. These parameters are being optimized in respect to dewatering rate, expended energy per unit of water removed and electrochemical effects. 10 refs., 7 figs.

38755 **(UCID—20297-85-2) Granular Flow Project quarterly report, April-June 1985.** Walton, O.R. (ed.). (Lawrence Livermore National Lab., CA (USA)). Jun 1985. Contract W-7405-ENG-48. 15p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015503.

The major effort of LLNL's Granular Flow Project during FY 1985 is the development and application of new discrete particle computer models for simulating the flow behavior of granular solids and determining their rheologic behavior. During the first two quarters of FY 1985 we developed and tested some of the fundamental building blocks of our new discrete models including new interparticulate force models for frictional, inelastic contacts between disks and spheres and a two-dimensional steady-state shearing model with periodic boundaries utilizing these new interaction models. Descriptions of the interparticulate force models, the steady shearing model and a preliminary two-dimensional shearing parameter study have already been reported. 7 refs., 4 figs.

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REFER ALSO TO CITATION(S) 38720, 38747, 38751, 39070, 39469, 39470, 39471

38756 **(BNL—36667) Morphological stability in the restricted model of a burning spherical particle.** McGraw, R.; Wegrzyn, J. (Brookhaven National Lab., Upton, NY (USA)). Apr 1985. Contract AC02-76CH00016. 13p. (CONF-850406—12). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015193.

From International symposium and workshop on particulate and multi-phase processes and the 16th annual meeting of the Fine Particle Society; Miami Beach, FL, USA (22 Apr 1985).

The coupling of heat and mass transfer fluxes at the receding boundary of a burning spherical particle is shown to give rise to morphological instability characterized by the presence of a well defined regime in which small distortions from a spherical, shape-preserving mode of burning grow in time. Similarities are investigated between the present case and spatial pattern formation through the first-order phase transformation processes of dendritic and snowflake growth. Applications to pulverized coal combustion are described.

38757 **(CONF-841201—33) Combustion testing of coal-water and coal-methanol-water mixtures in oil-designed boilers.** Fu, Y.C.; Bellas, G.T.; Joubert, J.I. (USDOE Pittsburgh Energy Technology Center, PA). 1984. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014347.

From ASME winter annual meeting; New Orleans, LA, USA (9 Dec 1984).

The combustion characteristics of coal-water mixtures (CWM) and coal-methanol-water (CMW) mixtures have been evaluated using an oil-designed 100-hp (0.98-MW) firetube boiler and an oil-designed 700-hp (6.87-MW) watertube boiler. Combustion tests were conducted in the 700-hp boiler using CMW mixtures prepared with a high-volatile A bituminous coal and a high-volatile C bituminous coal. Atomizing air with pressure at the burner of 120 to 130 psig was used. With CMW mixtures containing 60 wt % hvAb coal, the minimum level of methanol required without using preheated combustion air was about 16 wt %, while CMW mixtures containing 51 wt % hvCb coal required a methanol level greater than 23 wt %. Only 51 wt % hvCb coal could be added to the CMW mixtures because of the formation of high-viscosity mixtures that resulted in high fuel pump pressure and nozzle-plugging problems. The carbon conversion efficiencies at full load were all better than 99.4% for hvCb CMW mixtures containing 12% to 45% methanol by weight and for combustion air temperatures ranging from ambient to 500°F (260°C). In comparison, the carbon conversion efficiencies obtained for hvAb CMW mixtures containing 0 to 39% methanol by weight were in the 92 to 98% range for combustion air temperatures ranging from ambient to 500°F. Combustion tests were conducted in both boilers with a commercially prepared CWM fuel containing 70 wt % Eastern US bituminous coal to compare performance under similar operating conditions. A 270-h duration test was conducted in the 100-hp firetube boiler at full load using 530°F (277°C) combustion air to determine the behavior of ash accumulation in the furnace. 4 refs., 12 figs., 13 tabs.

38758 **(DOE/ET/10393—1855) Performance of high and low temperature refractories.** (NCB (IEA Grimethorpe) Ltd., Grimethorpe, Barnsley, South Yorkshire (UK)). Jun 1985. Contract AI01-76ET10393. 127p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE85008604.

Refractory is used extensively in the furnace and gas paths at the Experimental Pressurized Fluidized Bed Combustion Facility at Grimethorpe, South Yorkshire, England. The report covers aspects of the design, curing and the final condition of the refractories used. The report covers the period from initial curing of the refractory, in September 1979, until March 1984. 9 refs., 50 figs., 5 tabs.

38759 **(DOE/ET/13410—T5) Enhanced combustion of fossil fuel particles in oscillating flow. Annual technical report, September 1, 1979-August 31, 1980.** Lyman, F.A.; Sabnis, J.S. (Syracuse Univ., NY (USA). Dept. of Mechanical and Aerospace Engineering). 31 Aug 1980. Contract FG22-78ET13410. 43p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015967.

Apparatus was constructed to measure the burning time of particulates of different size ground to a spherical shape. The reduction in burning time varies from about 49% for 1.3 mm diameter particle in oscillating flow with a flow frequency of 54 Hz to about 10% for 2.4 mm diameter particle with a flow frequency of 130 Hz. Oscillating flow seems to reduce the burning time, but the effect is less significant for larger-sized particles. Also, reduction in burning time caused by low-frequency oscillations seems to be more pronounced than that caused by flow with higher frequency. Another significant result obtained from these experiments is the observation of a two-stage combustion process that occurs under oscillating flow. 18 refs., 7 figs., 2 tabs.

38760 **(DOE/PC/40268—8-Pt.1) Investigation of pyrite as a contributor to slagging in eastern bituminous coals. Final report. Part 1.** Bryers, R.W.; Walchuk, O.R. (Foster Wheeler Development Corp., Livingston, NJ (USA)). Mar 1985. Contract AC22-81PC40268. 231p. NTIS, PC A11/MF A01; 1; GPO Dep. File Number DE85014561.

Variations in composition of the slag when compared with coal ash, suggested specific minerals are being selectively deposited on furnace walls depending upon their specific gravity, size, composition, physicochemical properties, and association with carbonaceous material and other mineral matter. The impact of specific mineral forms and the manner in which they occur in coal on fireside deposits was investigated by first characterizing the distribution of minerals and inorganic elements in coal, and then examining the chemistry and morphology of the deposits formed on heat transfer surfaces in a combustor nominally rated at 100 lb/h. Determination of the distribution of mineral matter in the coal was accomplished by performing a mineral analysis on low-temperature ash and the elemental analysis on ASTM ash in size and gravity fractionated coal pulverized to 50% through 200 mesh. A washability test was performed on the coal causing the most severe slagging. The coal was then washed, pulverized, and burned in the combustor, permitting an evaluation of coal cleaning on a specific coal. The program was divided into six tasks: selection of eight candidate coals; chemical characterization of the coal samples and identification of pyrite, size, distribution and orientation with respect to other mineral matter and concentration levels; testing of the candidate coals in a laboratory furnace; chemical and physical characterization of the slag and fly ash samples created by the impurities in the coal sample; influence of coal beneficiation on furnace slagging; and analysis of data and identification of parameters influencing the contribution of pyrite to slagging problems. This volume covers tasks 1 through 4. 93 figs., 39 tabs.

38761 **(DOE/PC/40268—8-Pt.2) Investigation of pyrite as a contributor to slagging in eastern bituminous coals. Final report. Part 2.** Bryers, R.W.; Walchuk, O.R. (Foster Wheeler Development Corp., Livingston, NJ (USA)). Mar 1985. Contract AC22-81PC40268. 262p. NTIS, PC A12/MF A01; 1; GPO Dep. File Number DE85014562.

Variations in composition of the slag when compared with coal ash, suggested specific minerals are being selectively deposited on furnace walls depending upon their specific gravity, size, composition, physicochemical properties, and association with carbonaceous material and other mineral matter. The impact of specific mineral forms and the manner in which they occur in coal on fireside deposits was investigated by first characterizing the distribution of minerals and inorganic elements in coal, and then examining the chemistry and morphology of the deposits formed on heat transfer surfaces in a combustor nominally rated at 100 lb/h. Determination of the distribution of mineral matter in the coal was accomplished by performing a mineral analysis on low-temperature ash and the elemental analysis on ASTM ash in size and gravity fractionated coal pulverized to 50% through 200 mesh. A washability test was performed on the coal causing the most severe slagging. The coal was then washed, pulverized, and burned in the combustor, permitting an evaluation of coal cleaning on a specific coal. The program was divided into six tasks: selection of eight candidate coals; chemical characterization of the coal samples and identification of pyrite, size, distribution and orientation with respect to other mineral matter and concentration levels; testing of the candidate coals in a laboratory furnace; chemical and physical characterization of the slag and fly ash samples created by the impurities in the coal sample; influence of coal beneficiation on furnace slagging; and analysis of data and identification of parameters influencing the contribution of pyrite to slagging problems. This volume contains: work done for tasks 5 and 6; summary, discussion and conclusions; acknowledgements; and appendices. 78 figs., 20 tabs.

38762 **(DOE/PC/51504—9) Operation and maintenance of DOE/PETC Combustion Test Facilities. Final activity report, December 20, 1982-January 18, 1985.** (Management and Technical Services Co., Philadelphia, PA (USA)). 1985. Contract AC22-82PC51504. 190p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE85015574.

On December 20, 1982, Management and Technical Services Company/General Electric (MATSCO/GE) began to operate, modify and maintain the Combustion Test Facilities at the Pittsburgh Energy Technology Center (PETC). The work is divided into three main programs: Alternate Fuels/In-House Research, Flue Gas Cleanup Research and Development, and Advanced Research and Technology Development. The objectives of the initial programs were to (1) retrofit the boilers with minimum modifications; (2) prepare CWM with coal concentrations that result in acceptable

mixing, handling, and transport characteristics; (3) achieve stable CWM flames in boilers without supplemental fuel assistance; and (4) establish CWM combustion characteristics. In the 700-HP CTF, investigations into the effects on combustion of methanol addition, coal particle size, and oxygen enrichment of the combustion air were pursued, as well as evaluation of various burners, reduction of NO/sub x/ emissions through the introduction of staged air, and evaluation of anthracite CWM combustion. Work at the 100-HP CTF focused on investigation of coal particle size, use of various coal and petroleum by-products, the effects of long-term ash deposition in the boiler, and new burner nozzle adaptations. In December, 1983, MATSCO/GE assumed responsibilities of operation, modification, and maintenance of the Coal-Fired Flue Gas Cleanup Test Facility. The Dry Combined Flue Gas Cleanup PDU was completely built and shaken down, and formal testing of lime slurry injection into the flue gas for SO_2/NO/sub x/ reduction was initiated. In the Copper Oxide Continuous Life Cycle PDU, construction of the furnace was completed and construction of the absorber and regenerator units was begun. 15 figs., 10 tabs.

38763 **(DOE/PC/70764—2) Effect of in-situ heat treatment on coal char reactivity. Progress report, October 1, 1984-April 30, 1985.** Essenhigh, R.H. (Ohio State Univ. Research Foundation, Columbus (USA)). Jul 1985. Contract FG22-84PC70764. 86p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85015121.

The three parts of this report (by different authors) have been entered individually into EDB and ERA. (LTN)

38764 (DOE/PC/70764—2, pp 1-50) **Char reactivity determination in a high density combustion furnace, October 1984-April 1985.** Essenhigh, R.H.; Gangaram, D. Jul 1985. NTIS, PC A05/MF A01. File Number DE85015121.

In Effect of in-situ heat treatment on coal char reactivity. Progress report, October 1, 1984-April 30, 1985.

The primary objective was to determine whether char reactivity is reduced by high intensity heat treatment. From the experiments carried out in the furnace, the results show that char reactivity is being reduced by approximately an order of magnitude; however, we need to improve our level of confidence in the results by doing more experiments. (A maximum of 3 with complete data would be sufficient). Furnace gas analyses on CO_2 and O_2 show that CO_2 and O_2 do not exhibit behavior as in normal flames. In normal flames as O_2 is depleted, CO_2 is generated. In this arrangement the effect of secondary air addition downstream of the primary has the O_2 concentration going up and CO_2 concentration going down upstream of the secondary air injection point. The reason for this behavior is that the O_2 is backmixing considerably and diluting the gas mixture upstream of the secondary air injection. As a result, although there are combustion reactions to CO_2, this effect is not seen and we observe the CO_2 concentration going down and the O_2 concentration going up. However, with continued reaction, the concentration trend is reversed downstream of the secondary air inection point. To characterize backmix behavior we plan to do experiments on the furnace using helium as a tracer. This will enable us to determine dispersion coefficients which are needed in the mathematical model. 33 figs., 2 tabs.

38765 (DOE/PC/70764—2, pp 51-79) **Temperature measurement in flames, January 1985-March 1985.** Essenhigh, R.H.; Shaw, D.W. Jul 1985. NTIS, PC A05/MF A01. File Number DE85015121.

In Effect of in-situ heat treatment on coal char reactivity. Progress report, October 1, 1984-April 30, 1985.

Four methods of measuring temperatures in pulverized coal flames are being investigated or developed: (1) the suction pyrometer, which is thought to measure a weighted average of the gas and particle temperatures; (2) two-color pyrometer, primarily to measure the particle temperatures; (3) sodium line-reversal, primarily to measure the gas temperature; and (4) OH peak method in the uv, as a new alternative to sodium line-reversal which may be superior for measuring gas temperatures in the presence of particles. This report describes progress, mainly on development of the first two techniques, and plans now being implemented for development of the last two. 4 refs., 12 figs., 2 tabs.

38766 (DOE/PC/70764—2, pp 81-88) **Determination of dispersion coefficients by transient helium tracer pulse, April 1985.** Essenhigh, R.H.; Phillips, E.W.; Wade, B.L.; Nakamura, S. Jul 1985. NTIS, PC A05/MF A01. File Number DE85015121.

In Effect of in-situ heat treatment on coal char reactivity. Progress report, October 1, 1984-April 30, 1985.

A pulse of tracer injected into a flowing fluid (e.g. helium in air) is shown to disperse upstream and downstream from the (moving) pulse center as the result of dispersion. The dispersion coefficient is determined from the pulse shape measured at known times after injection of the pulse. These experiments are part of a procedure being developed to determine the mixing behavior of the secondary air in the associated experiments on the effect of heat treatment on char reactivity. Secondary air is injected some distance below the primary flame zone to burn-out char formed in the primary reaction. The secondary air does not mix instantaneously, however; there is substantial backmix upstream so that the char is subjected to a steadily rising oxygen concentration as it passes through the secondary-air oxidation zone. The objective of the mixing experiments is to be able to quantify the backmix behavior. The results show that the technique is capable of yielding dispersion coefficients. The results also support the method of analysis. The values are evidently in agreement with other data according to the successful comparison with the Levenspiel graphs. The numerical values are of interest being, at 150 sq.cm/sec, about 3 orders larger than the molecular values. It would appear from this that the molecular diffusivity is not likely to result in inapplicable results when studying the backmix problem. The work is continuing: a further task is to extend measurements into the turbulent region. 1 ref., 2 figs.

38767 (DOE/PC/70771—T1, pp 4.1-4.19) **Mechanisms governing the destruction of nitrogen species during staged coal combustion.** Wendt, J.O.L.; Dannecker, K.M. (Univ. of Arizona, Tucson). 1985. NTIS, PC A05/MF A01. File Number DE85014943.

In Kinetics of sulfur and nitrogen reactions in combustion systems. Quarterly report No. 1.

Effects of coal composition on fuel nitrogen mechaniams during fuel rich combustion of pulverized coal were experimentally investigated in a 2 kg/hr down fired combustor. Although there is some variation from coal to coal, the data support the hypothesis that N_2 formation, NH_3 formation and destruction, and NO destruction follow the Fenimore mechanism. HCN destruction is also consistent with Fenimore, although there appears to be a source causing HCN formation. 7 refs., 18 figs., 1 tab.

38768 **(DOE/S—0034) Report to Congress on emerging clean coal technologies.** (USDOE Office of the Secretary, Washington, DC). May 1985. 270p. NTIS, PC A12/MF A01; 1; GPO Dep. File Number DE85015420.

Section 321 of the Department of the Interior and Related Agencies Appropriations Act for Fiscal Year 1985 as enacted by House Joint Resolution 648, Public Law 98-473, 98 Stat. 1874, directed the Secretary of Energy to solicit from the private sector "statements of interest in, and proposals for projects employing emerging clean coal technologies," to analyze the submissions, and to submit a Report to Congress that "assesses the potential usefulness of each emerging clean coal technology" and "identifies the extent to which federal incentives, including financial assistance, will accelerate the commercial availability of these technologies." Responsibility for implementation of Section 321 was delegated to the Assistant Secretary for Fossil Energy. The Office of Fossil Energy drafted the Program Announcement, arranged the mechanics of submission handling, storage, and disposal, and provided for submission analysis and writing of this Report. As expected the Program Announcement elicited a voluminous response, and many of the submissions contained proprietary or business confidential material. The assessments, included in Appendix C, provide information on what each technology is and how it works, the Department and private sector research, development, and demonstration programs, and on its anticipated environmental performance, economics, and their potential usefulness. After review of the submittals, the Department has concluded that federal incentives will not accelerate commercialization of these technologies and may be

counterproductive to their development. These conclusions are based upon the Department's previous experiences with federal incentives.

38769 **(PB—85-189801/XAB) Testing of Western Kentucky No. 9 coal in an atmospheric fluidized-bed combustor. Technical report.** Pettit, R. (Kentucky Univ., Lexington (USA). Inst. for Mining and Minerals Research). May 1984. 152p. (IMMR—84-099). NTIS, PC A08/MF A01.

Sponsored by Kentucky Energy Cabinet, Lexington.

This report deals with the characterization of a western Kentucky No. 9 coal as an atmospheric fluidized-bed combustor (AFBC) feedstock. It is the first of a series of four reports, each dealing with a different Kentucky coal. All of the coal tests were conducted using an Oregon dolomite from the central Kentucky region. The tests were conducted in a 2 ft. 8 in. x 2 ft. 5 in. atmospheric fluidized bed combustor. The Western Kentucky No. 9 coal tested had a heating value of 12200 Btu/lb. The Oregon dolomite used contained 61% $CaCO_3$ and 31% $MgCO_3$. Detailed feedstock analyses are presented in Appendix E. Seven steady-state test runs were conducted over a two-week period. The runs were at one of 100%, 85%, or 70% loads. The air flowrate, bed temperature, and stack sulfur dioxide emissions rate were kept approximately constant during these tests to facilitate comparison.

0150 Marketing And Economics

REFER ALSO TO CITATION(S) 39414

38770 **Effects of technological change, experience, and environmental regulation on the construction cost of coal-burning generating units.** Joskow, P.L.; Rose, N.L. (Massachusetts Institute of Technology, Cambridge). *Rand Journal of Economics;* **16**: No. 1, 1-27(Spr 1985).

This article analyzes the technological, regulatory, and organizational factors that have influenced the costs of building coal-burning steam-electric generating units over the past twenty years. Estimates of economies of scale in construction costs, learning effects associated with utilities and architect-engineers, the costs of environmental regulation, patterns, of construction productivity, and cost differences between generating technologies are presented. The results suggest that there are substantial economies of scale associated with the construction of generating units as well as experience effects for both utilities and architect-engineers. The importance of each effect varies across generating technologies. The real costs of generating units have increased dramatically since the late 1960s. These cost increases are only partially attributable to easily measurable responses to environmental restrictions. 35 references, 2 figures, 4 tables.

0160 Health And Safety

REFER ALSO TO CITATION(S) 38733, 39786

38771 (BM-IC—8986, pp 2-13) **Introduction.** Murphy, J.N. (Bureau of Mines, Pittsburgh, PA). 1984. US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533. (CONF-8407131—; CONF-8407132—).

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

This overview of the noise pollution problem in mining includes the text of federal noise pollution regulations.

38772 (BM-IC—8986, pp 14-18) **Bureau of Mines occupational noise control program.** Daniel, J.H. (Bureau of Mines, Washington, DC). 1984. US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533. (CONF-8407131—; CONF-8407132—).

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

The following are the objectives of Bureau programs to develop noise abatement technology: To determine major noise sources in underground and surface mines and mineral processing plants. To develop and evaluate both factory-installed noise controls for equipment and processing operations and noise-control field modifications to existing equipment. To provide more accurate noise exposure measuring techniques and instrumentation. To establish a procedure to evaluate the actual noise attenuation of personal hearing protectors worn by miners. To develop concepts and design techniques that will provide inherently quieter mining equipment and operations for the future. To make available to industry the technical knowledge needed to select, design, and use the most effective noise-control measures.

38773 (BM-IC—8986, pp 19-36) **Noise exposures of mobile machine operators in US surface coal mines and noise control techniques.** Bartholomae, R.C.; Aljoe, W.W. (Bureau of Mines, Pittsburgh, PA). 1984. US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533. (CONF-8407131—; CONF-8407132—).

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

The reduction of the noise exposure of operators of mobile surface mine equipment has been a primary objective of the Bureau of Mines. Approximately 25,000 mobile equipment operators in US surface coal mines (45% of the operators) are overexposed to noise. These mobile machines include bulldozers, front-end loaders, haulers, shovels, draglines, trucks, scrapers, drills, and motor graders. Bull-dozers and front-end loaders cause about two-thirds of the noise overexposures. The most cost-effective operator noise exposure control was determined to be acoustical cabs. 6 refs., 11 figs., 11 tabs.

38774 (BM-IC—8986, pp 37-44) **Reduced-noise auger miner cutting head.** Algoe, W.W.; Pettitt, M.R. (Bureau of Mines, Pittsburgh, PA; Wyle Labs., Huntsville, AL). 1984. US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533. (CONF-8407131—; CONF-8407132—).

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

After extensive laboratory and in-mine tests, a cost-effective, mineworthy, reduced-noise auger miner cutting head was designed, fabricated, and field tested by Wyle Laboratories, under Bureau of Mines contract H0188065. Compared with standard auger cutting heads, the new heads reduced noise by 10 dBA at the jacksetter's position and 6 dBA at the operator's position. The reduced-noise heads were able to cut and load coal as effectively as the standard heads and are now being used successfully in several underground mines. Mine shops can easily modify the standard auger cutting heads to produce the reduced-noise design.

38775 (BM-IC—8986, pp 45-65) **Coal cutting noise control.** Pettitt, M.R.; Aljoe, W.W. (Wyle Labs., Huntsville, AL; Bureau of Mines, Pittsburgh, PA). 1984. US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533. (CONF-8407131—; CONF-8407132—).

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

The results of a Bureau of Mines laboratory investigation of coal cutting mechanics and noise are presented. Some basic theoretical aspects of coal cutting mechanics and noise generation are discussed, and the results of the laboratory experiments are used to formulate analytical models of the coal cutting forces and noise. It is concluded that by using deeper depths of cut, slower cutting speeds, and more efficient cutting tools, it is possible to reduce the level of coal cutting noise as well as provide benefits to other important areas of underground health and safety. In addition to these basic operational parameters, fundamental structural design criteria for reduced-noise coal mining machine cutting heads are also presented. 12 refs., 21 figs., 2 tabs.

38776 (BM-IC—8986, pp 66-73) **Mantrip noise controls.** Bartholomae, R.C.; Bobick, T.G. (Bureau of Mines, Pittsburgh, PA). 1984. US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533. (CONF-8407131—; CONF-8407132—).

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

The interior noise of an underground mine rail-operated personnel carrier (mantrip vehicle) was cost effectively reduced by replacing some standard components with acoustically treated components. The noise control features included a softer suspension, softer motor mounts, damped panels, sound-absorbing motor enclosures, and helical gears. Depending on operating conditions, the modified vehicle was 6 to 7.5 dBA quieter than an unquieted mantrip. The noise level in the mantrip interior was reduced to approximately 85 dBA at an average vehicle speed. These noise control features increased the overall mantrip cost by less than 5%.

38777 (BM-IC—8986, pp 74-89) **Quieted percussion drills.** Aljoe, W.W. (Bureau of Mines, Pittsburgh, PA). 1984. US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533. (CONF-8407131—; CONF-8407132—).

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

Percussion-type rock drills are commonly used in both coal and metal-nonmetal mines; they produce extremely high noise levels (110 to 120 dBA) and have complex noise-generating mechanisms. Therefore, engineering noise controls for percussion drills have been very difficult to achieve. However, substantial progress has been made toward this goal through the use of retrofit techniques and percussion drill redesign. This paper provides an overview of Bureau-sponsored research programs aimed at reducing the noise produced by percussion drills. 10 refs., 10 figs., 1 tab.

38778 (BM-IC—8986, pp 90-106) **Current status of load-haul-dump machine noise control.** Bobick, T.G.; Madden, R. (Bureau of Mines, Pittsburgh, PA; Bolt Beranek and Newman, Inc., Cambridge, MA). 1984. US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533. (CONF-8407131—; CONF-8407132—).

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

This Bureau of Mines paper reviews the initial noise control research conducted on a load-haul-dump (LHD) machine with a 5-yd^3 bucket capacity. Additional noise control research has been conducted on five other vehicles - three 2-yd^3- and two 8-yd^3-capacity vehicles. This paper presents a description of the machines treated, a general discussion of the noise control treatments used, and a summary of the acoustic and thermal performance of the treatments. 16 figs., 4 tabs.

38779 (BM-IC—8986, pp 107-119) **Retrofit noise controls for crushing and screening plants.** Muldoon, T.L.; Bobick, T.G. (Foster-Miller, Inc., Waltham, MA; Bureau of Mines, Pittsburgh, PA). 1984. US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533. (CONF-8407131—; CONF-8407132—).

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

During a Bureau of Mines sponsored research program, retrofit noise control treatments were successfully installed and evaluated in a primary crushing plant and two secondary crushing and screening plants. A control booth was installed at the primary crushing plant; the noise levels at the operator's location were reduced from 97 to 78 dBA. Noise levels measured at normal cleanup locations were reduced by 4 to 7 dBA (97.5-98 to 91-93.5 dBA) at one of the two secondary plants. This paper describes how to design, select, and install similar retrofit noise control treatments for crushing and screening plants.

38780 (BM-IC—8986, pp 120-129) **Noise control in coal preparation plants.** Bobick, T.G.; Rubin, M.N. (Bureau of Mines, Pittsburgh, PA; Bolt Beranek and Newman Inc., Cambridge, MA). 1984. US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533. (CONF-8407131—; CONF-8407132—).

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

This paper presents the results of two recent Bureau of Mines sponsored programs related to noise control in coal preparation plants. These programs were aimed at evaluating engineering controls for reducing the occupational noise exposure of plant workers. The first of these two programs evaluated the performance of various noise control techniques in an operating preparation plant. Four general categories of noise control treatments were selected, installed, and monitored over an extended period of time to evaluate their acoustic performance and durability. The four categories were resilient screen decks, resilient impact pads, chute liners, and mass-loaded curtains. This program demonstrated that the treatments can be both effective (providing 5 to 10 dBA of noise reduction) and durable (with effective service lives of 1 to 4 yr). The second project focused on documenting noise control treatments that can be incorporated into new coal preparation plants at the design stage. While some of the treatments considered were similar to those evaluated in the previous project, a number of additional techniques were also considered, such as equipment substitutions and changes in plant layout. Consideration of these techniques is possible for new plants because of the design flexibility provided during the planning stage of a new facility. 10 figs.

38781 (BM-IC—8986, pp 130-141) **Overview of Bureau of Mines hearing protection research.** Redmond, G.W.; Burks, J.A. (Bureau of Mines, Pittsburgh, PA). 1984. US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533. (CONF-8407131—; CONF-8407132—).

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

Hearing protective devices (HPD's) can be a useful adjunct in an overall program designed to control the noise exposure of miners. Performance data on HPD's obtained using standard laboratory measurements appear to overestimate the amount of protection from noise overexposure a working miner may receive from these devices. In order to more effectively evaluate hearing protector performance, the Bureau of Mines is investigating the basic parameters that influence the noise attenuating properties of HPD's. Initial phases of this research have focused on ear muff-type protectors. Alternative methods for the determination of total attenuation of ear muffs have been compared with the standard laboratory procedure and potential problem areas have been defined. Investigation of human physiological parameters that may affect the intrinsic noise level under a single earcup is being made to measure the absolute or baseline value that might be used as a reference level for the physical measurement of ear muff attenuation. 16 refs., 4 figs.

38782 (PB—85-178556/XAB) **Health hazard evaluation report HETA 81-472-1380, Pennsylvania Power and Light, Martins Creek Steam Electric Station, Martins Creek, Pennsylvania.** Lewis, F.A. (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)). Oct 1983. 13p. NTIS, PC A02/MF A01.

In August 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request from the International Brotherhood of Electrical Workers Local 1600 for a Health Hazard Evaluation at the Pennsylvania Power and Light Company's Martins Creek Steam Electric Station in Martins Creek, Pennsylvania. The union was concerned about potential health and explosion hazards to employees from coal dust in Units 1 and 2 and the coal field. Based on environmental studies conducted at the time of the survey, NIOSH has determined that a potential health hazard may have existed due to exposure to respirable coal dust and quartz. Recommendations were made to ensure that potential health and explosion hazards are avoided in the future.

38783 (PB—85-185247/XAB) **Development of an automated breathing metabolic simulator (ABMS). Open File report.** Wischhoefer, L.L.; Reimers, S.D. (Reimers Consultants, Falls Church, VA (USA)). Jan 1984. 51p. NTIS, PC A04/MF A01.

See also PB-226687.

The automated breathing metabolic simulator (ABMS) is a versatile machine capable of performing almost any physiologically appropriate respiratory simulation. Since the first ABMS was delivered to the Bureau of Mines in 1973, efforts have been made to refine the systems and components that make up the ABMS, including the breathing simulator module, gas analysis module, and supervisory controller, each of which are capable of stand-along operation. In order to improve the equipment and to develop simu-

lation criteria and parameters, testing and modifying the ABMS has been continuing since 1980. Changes have been made to the phase I design plan and performance specifications, future improvements based on current experience are recommended, and test results of full-scale testing conducted in November 1983 on several types of breathing apparatus are reported and illustrated.

0170 Legislation And Regulations

REFER ALSO TO CITATION(S) 38770

02 PETROLEUM

0201 Reserves

38784 **(OCS/MMS—85-0012) Estimates of undiscovered, economically recoverable oil and gas resources for the Outer Continental Shelf as of July 1984.** Cooke, L.W. (Minerals Management Service, Washington, DC (USA). Offshore Resource Evaluation Div.). 1985. 43p. Minerals Management Service, 12203 Sunrise Valley Dr., Reston, VA 22091. File Number TI85901846.

This report was prepared as part of the analysis for the proposed 5-year Outer Continental Shelf Oil and Gas Leasing Schedule announced in March 1985 by Department of the Interior Secretary Donald Hodel. The estimates are of potential commercial accumulations of oil and gas outside known fields and are based upon recent geologic, geophysical, engineering, and economic data. The report was prepared by the Minerals Management Service. Proprietary seismic data, well logs, and well information were used in computing the new estimates. Methods used to develop the estimates included a rigorous assessment of the amount of hydrocarbons necessary to comprise a commercial field taking into account water depth, distance from shore, drilling depth, potential reservoir characteristics, and oil price expectations. The report includes estimates for unleased undiscovered resources, undiscovered resources on currently leased acreage, and the total estimates of leased and unleased undiscovered economically recoverable resources. 19 refs., 5 figs., 6 tabs.

0202 Geology And Exploration

38785 **(AD-A—149146) US capability to support ocean engineering in the Arctic.** (National Research Council, Washington, DC (USA). Committee on Assessment of Arctic Ocean Engineering Support Capability). 1984. 151p. NTIS, PC A08/MF A01. File Number TI85901702.

The size of the Alaska Outer Continental Shelf (OCS) measures more than 1.8 million square kilometers around the state's nearly 11,000-kilometer coastline. It represents 74% of the total offshore area of the United States. The majority of this area, 1.2 million square kilometers, is north of the Alaska Peninsula. In a National Petroleum Council report (NPC, 1981) it is estimated that the undiscovered, potentially recoverable reserves in the basins north of the Aleutians are about 30 billion barrels oil equivalent. Another study by the US Geological Survey (USGS, 1981) gives a 21 billion barrel estimate for the same basins. Thus, perhaps as much as 25 to 30% of domestic undiscovered hydrocarbon recoverable reserves may come from these Arctic offshore areas. The Arctic, however, is a harsh environment for man and machine. Its continued offshore and coastal resource development demands greater engineering support than do other parts of the world. The capability of government and industry to respond to these engineering requirements has not been assessed. In response to the Marine Board's recognition of the need for such an assessment, a committee was appointed by the National Research Council to conduct a study. This report represents the findings, conclusions, and recommendations of the Committee on Assessment of Arctic Ocean Engineering Support Capability. 64 refs., 8 figs.

38786 **(DOE/METC—85/6014) Arctic energy technologies workshop: proceedings.** (USDOE Morgantown Energy Technology Center, WV). Apr 1985. 225p. (CONF-8411108—). NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE85003360.

From Arctic energy technologies workshop; Morgantown, WV, USA (14 Nov 1984).

The objectives of this "Arctic Energy Technologies Workshop" were threefold: To acquaint participants with the current US Department of Energy, Office of Fossil Energy, Arctic and Offshore Research Program. To obtain information on Arctic oil and gas development problem areas, and on current and planned research. To provide an opportunity for technical information exchange among engineers, geologists, geophysicists, physical scientists, oceanographers, statisticians, analysts, and other participants engaged in similar research areas. The first section of the proceedings is the keynote address "Current Arctic Offshore Technology", presented by Kenneth Croasdale, of K.R. Croasdale and Associates, Ltd., Calgary, Alberta, Canada. The second section of the proceedings includes 14 technical papers presented in two sessions at the Workshop: Sea Ice Research, and Seafloor/Soils Research. The third section of the proceedings includes the summaries of four work-group discussion sessions from the second day of the meeting: (1) Arctic Offshore Structures, (2) Arctic Offshore Pipelines, (3) Subice Development Systems, and (4) Polar-Capable Ice Vessels. The work groups addressed state-of-the-art, technical issues, R and D needs, and environmental concerns in these four areas. All papers in this proceedings have been processed for inclusion in the Energy Data Base.

0203 Drilling And Production

REFER ALSO TO CITATION(S) 38803, 38810, 39760

38787 **(DOE/BC/10345—6) Tertiary oil recovery processes research at the University of Texas. Final report, October 1980-December 1984.** Schechter, R.S.; Wade, W.H. (Texas Univ., Austin (USA)). Sep 1985. Contract AS19-80BC10345. 153p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE85000139.

This report summarizes four years of research jointly funded by the Department of Energy and by a number of companies all interested in enhanced oil recovery using micellar/polymer processes. The fundamental thrust of the research was to study the influence of surfactant structure on those physical chemical aspects such as oil/water interfacial tensions and adsorption which have an impact on the efficiency of the flooding process. The role of surfactant structure is therefore the unifying theme which links all of the various projects described here. In many cases we perceived the need to carry out studies using surfactant systems which were essentially pure. During the middle and latter phases of this project that part of our research team responsible for the synthesis of pure surfactants developed methods which provided surfactants of high quality. Tests using various techniques (NMR, phase behavior, etc.) were carried out to ensure their quality. Contents of the this report include extended summary of research accomplishments, publications produced from research, postdoctoral and graduate participants, and the following research reports; (1) alcohol-free microemulsions; (2) adsorption of surfactants from dilute solutions; (3) adsorption of surfactant mixtures; (4) optimum surfactant hydrocarbon tail structures; (5) synthesis and performance of linear monisomeric ethylene oxide sulfonate; (6) adsorption from microemulsions; (7) monomer-micellar equilibria; (8) surfactant chromatography; (9) partitioning of surfactant between phases; and (10) spontaneous emulsification and diffusion in microemulsions.

38788 **(DOE/CE/15216—T1) [Field testing of enhanced recovery pump for petroleum]. First quarter research summary.** Jones, W.A. (Jones (William A.) and Associates, Lotus, CA (USA)). [1985]. Contract FG01-85CE15216. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014696.

Progress is reported on well selection, contractor cooperation, and energy conservation results from experimental pump design. (PSB)

38789 **(SAND—85-0076C) In situ stress measurements in inclined holes in the North Sea: application to enhanced oil recovery.** Teufel, L.W. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 2p. (CONF-850941—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85006740.

From European offshore conference; Aberdeen, UK (10 Sep 1985).

Eighteen in situ stress measurements were made in two 3.5 km deep wells in a reservoir located in the Viking Graben region of the North Sea. The wellbores were inclined 60° and 70° from the vertical. The principal in situ stress directions and magnitudes were determined by the anelastic strain recovery method. The principal stress directions were determined directly from measurements of the principal strain recovery directions of oriented core immediately after it was retrieved from the wellbore. The principal stress magnitudes were calculated from the principal strain recovery magnitudes, overburden stress, and elastic properties of the rock using a creep recovery model. The reliability and accuracy of the strain recovery method has been documented in several vertical holes by direct comparison with open hole hydraulic fracture stress measurements. In the two inclined holes in the North Sea, the maximum principal stress was the overburden, and the average ratios of the maximum and minimum horizontal stresses to the overburden were 0.93 and 0.78, respectively. The azimuth of the maximum horizontal stress (and hydraulic fracture) was N72°W +- 21°. The measured stress orientations are consistent with a geologic and tectonic model of the region. The calculated stress magnitudes indicate that potential hydraulic fractures created during the EOR program will be vertical and have a well defined azimuth because the overburden is the maximum stress and there is sufficient difference between the two principal horizontal stresses. The high ratio of the minimum stress to overburden indicates that high injection pressures will be required during stimulation, and this should be included in the stimulation design to optimize fracture length. Fracture length will depend upon the permeability of the formation, water quality, the total injected volume, and injection pressures.

38790 **(SAND—85-1125C) Thermal EOR: a review of insulated tubing and downhole steam generator materials evaluations.** Aeschliman, D.P.; Moreno, J.B.; Marshall, B.W. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 12p. (CONF-850710—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014839.

From 3. international conference on heavy crude and tar sands; Long Beach, CA, USA (22 Jul 1985).

A downhole steam generator post-field-test materials study program has been completed. For the particular combustor design that was tested, wall temperatures as high as 1500°F (816°C) were observed. Significant variations with respect to time and position were also observed. The CoCrAlY and FeCrAlY alloys appeared to suffer little chemical attack, but both were damaged by what we conclude to be thermally-induced stresses. This mechanism also appears to be a dominant component in the corrosive attack suffered by 310 SS. It was concluded that very thin combustor walls are required in this design to avoid the potentially damaging "alternating plasticity" and "ratcheting" regimes of cyclic thermal stress. A study of wellbore heat losses from steam injection wells equipped with insulated tubing and conventional (uninsulated) couplings was completed. This study has confirmed that overall wellbore heat loss is substantially higher than expected for good quality tubing with uninsulated couplings if the well bore is wet - an effect attributed to "wellbore refluxing." The temperature at which wellbore refluxing occurs is the boiling point of the annulus water, and is consequently a controllable function of annulus pressure. Reduction of annulus pressure is one means of decreasing the heat loss associated with the refluxing process. Another method is the use of insulated couplings which provided a sufficient thermal resistance to prevent boiling, and hence refluxing, even when totally immersed. Finally, the observation that steady wellbore refluxing can occur without visible steam venting at the wellhead demonstrates that operators should not assume a dry, nonrefluxing annulus based solely on the observed absence of venting. 9 refs., 7 figs.

38791 **(UCID—20485) PDCRAC: a three-dimensional hydrofracture program. User's manual.** Stout, R.B. (Lawrence Livermore National Lab., CA (USA)). Jul 1985. Contract W-7405-ENG-48. 47p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015529.

The PDCRAC (Pressure-Driven CRACk propagation) computer program was developed to analyze three dimensional aspects of the hydrofracture process in a layered gas/oil reservoir. This document is the user's manual for PDCRAC - Version 1.0. The crack shape and the wetted shape in the crack are modelled as two different free boundary problems such that each shape is an ellipse that propagates in the plane of the hydrofracture. The input requires initial conditions, geometry, elastic properties, fracture conditions set by crack opening displacement, viscous fluid properties, and a wellbore pressure history adjacent to the crack. The output consists of time histories for the crack opening, crack propagation velocities and fluid front propagation velocities along the two axes of the elliptical shaped crack and wetted surfaces, respectively, lengths of the axes for elliptical shaped crack and wetted surface, and fluid flow rate. The influence of layers on crack propagation can be simulated by the input of different fracture conditions for each layer. The model predicts that significant separation can occur between the crack front and the wetted front during hydrofracture because the crack propagation velocity is usually greater than the fluid front propagation velocity. Some exceptions to this separation are predicted for layered resource zones when crack arrest occurs. 6 refs., 33 figs., 2 tabs.

0205 Products And By-products

38792 **(AD-A—152801/7/XAB) Fuel freeze-point investigations. Final report, September 1982-March 1984.** Desmarais, L.A.; Tolle, F.F. (Boeing Military Airplane Co., Seattle, WA (USA)). Jul 1984. 286p. (D—180-28285-1). NTIS, PC A13/MF A01.

The objective of this program was to conduct a detailed assessment of the low-temperature environment to which USAF aircraft are exposed for the purpose of defining a maximum acceptable fuel freeze-point and also to define any operational changes required with the use of a high freeze-point fuel. A previous study of B-52, C-141, and KC-135 operational missions indicated that the -58 C freeze point specification was too conservative. Based on recommendations resulting from the previous program, several improvements in the method of analysis were made, such as: expansion of the atmospheric temperature data base, the addition of ground temperature analysis, the addition of fuel-freezing analysis to the one-dimensional fuel-temperature computer program, and the examination of heat transfer in external fuel tanks, such as pylon or tip tanks. The B-52, C-141, and KC-135 mission were analyzed again, along with the operational missions of two tactical airplanes, the A-10 and F-15; -50C was determined to be the maximum allowable freeze point for a general-purpose USAF aviation turbine fuel. Higher freeze points can be tolerated if the probability of operational interference is acceptably low or if operational changes can be made. Study of atmospheric temperatures encountered for the missions of the five-study aircraft indicates that a maximum freeze point of -48 C would not likely create any operational difficulties in Northern Europe.

0206 Health And Safety

38793 **(PB—85-178291/XAB) Collection of data and information on the appropriate personal protective equipment to be used by petrochemical workers.** Plummer, R.W.; Stobbe, T.J.; Morgensen, J.E.; McIntosh, J.D. (Occupational Safety and Health Administration, Washington, DC (USA)). 1985. 138p. NTIS, PC A07/MF A01.

It would be advantageous to develop specific personal protective equipment (PPE) standards for the major industrial classifications and trades. In order to accomplish this task, the authors previously developed a methodology for evaluating the current PPE practices used in industry. This specific project deals with the petrochemical industry; the job titles selected were chemical operator, repairer, laborer, mixer/compounder, weigher/bulker, helper

and lab analyst. This report describes both the methodology used and the results of its application to the petrochemical industry jobs. It provides data collected in 15 chemical plants. These results were combined with the results of Bureau of Labor Statistics-Work Injury Report Surveys to provide tentative PPE standards for the jobs studied.

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 39402, 39414

38794 **(DOE/EIA—0109(85/05)) Petroleum Supply Monthly, May 1985.** (USDOE Energy Information Administration, Washington, DC). Jul 1985. 104p. NTIS, PC A06/MF A01 - GPO; GPO Dep. File Number DE85015556.

This report contains detailed statistics on the supply and disposition of petroleum and petroleum products through May, 1985. Information on crude oil, finished motor gasoline, distillate fuel oil, residual fuel oil, liquefied petroleum gases are included. Detailed statistics show production for the current month as well as the year-to-date. Data are also tabulated for the US Petroleum Administration for Defense (PAD) Districts which include field production, refinery production, imports, stock withdrawal or addition, unaccounted for crude, net receipts, crude losses, refinery inputs, exports, products supplied, and ending stocks. This issue features a "Mid-Year Petroleum Review", beginning on page xiii and focusing on major petroleum supply developments in the first half of 1985 and the outlook for the remainder of the year. The article discusses changes in consumption, domestic crude oil production, refinery operations, foreign trade, stocks (including the Strategic Petroleum Reserve) and prices. 33 tabs.

38795 **(NP—5901849) Quarterly oil report, first quarter 1985. Volume V, Number 1.** (California Energy Resources Conservation and Development Commission, Sacramento (USA). Fossil Fuels Assessment Office). Jun 1985. 54p. California Energy Commission, 1516 Ninth Street, Sacramento, CA 95814. File Number TI85901849.

This quarterly oil report of California, contains data on the following: (1) petroleum fuels market activity which covers fuels supplied, fuel imports and exports, refinery operations, petroleum fuels stocks and market shares; (2) price trends which cover international and California crude oil prices, gasoline prices and margins, gasoline price comparisons by city, and diesel prices; (3) refinery activities; (4) exploration and production; and (5) exploration and production. 6 figs.

38796 **(OCS/MMS—85-0021) Outer Continental Shelf oil and gas activities in the Atlantic and their onshore impacts. Atlantic summary report, July 1, 1983-December 31, 1984.** Rudolph, R.W.; Havran, K.J. (Rogers, Golden and Halpern, Inc., Reston, VA (USA)). Dec 1984. 131p. Minerals Management Service, 12203 Sunrise Valley Dr., Reston, VA 22091. File Number TI85901864.

The search for oil and gas on the Outer Continental Shelf in the Atlantic continues. Hydrocarbon exploration efforts have been and probably will continue to be concentrated on four major sedimentary basins: the Georges Bank Basin, the Baltimore Canyon Trough, the Carolina Trough, and the Blake Plateau Basin. To date, 46 exploratory wells have been drilled in these areas, most of them in the Mid-Atlantic Planning Area where resource estimates indicate the hydrocarbon potential is the greatest of the three Atlantic Outer Continental Shelf planning areas. Currently, no operators are involved in exploration efforts in the Atlantic. No commercial discoveries have been announced. Since the first and most successful sale of Atlantic Outer Continental Shelf blocks in Lease Sale 40 in August 1976, there have been eight other sales bringing total revenues of almost $3 billion to the Federal Treasury. The current tentative milestone chart for the 5-year offshore leasing schedule calls for four additional lease sales to be held in the Atlantic Outer Continental Shelf. Although no firm plans have been made for the transportation of potential offshore hydrocarbons to onshore processing facilities, it is believed that oil would be transported by tanker or tug-barge system to existing refineries on the Raritan and Delaware Bays. Gas probably would be transported by pipeline to one of several onshore landfalls identifed by Atlantic Coast States and in Federal environmental impact documents. Recent onshore support for Atlantic Outer Continental Shelf exploration came from Davisville, Rhode Island, the only shore support base for the Atlantic that was active during 1984. Three maps are provided in the back pocket of this report for the North Atlantic, Mid-Atlantic and South Atlantic planning areas. 29 refs., 8 figs., 6 tabs.

0208 Waste Management

38797 **(DOE/CE/40664—T17) Field testing of a biphase rotary separator turbine for concentration of industrial process fluids. Technical progress report No. 18, 18 May-14 June 1985.** Maddox, P. (Transamerica Delaval, Inc., Santa Monica, CA (USA). Biphase Energy Systems). 1985. Contract AC02-83CE40664. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014682.

One key technical issue that bears on utility savings projections is that of machine design point for the wide flow processing range of this refinery. The flow will range from 20,000 to 32,000 bbl/day with a nominal gas loading of about 20 SCF/bbl of MW = 5.0 gas. As yet we have no duty cycle information from Champlin, which will be obtained if project approval is given by their management.

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 38785

38798 **(PB—85-180958/XAB) Warren Spring beach material washer.** Morris, P.R.; Walsh, T. (Warren Spring Lab., Stevenage (UK)). [1985]. 25p. (LR—490(OP)-M). NTIS, PC E03/MF E03.

The development of the Warren Spring Laboratory beach material washer is described and indications given of the likely quantities of soiled beach material which might be expected from a major oil spill affecting the coastline. The unit has now been developed as a fully working 20 tons/hour prototype, and it is anticipated that scale-up to a 50 tons/hour operational unit should not present any major problems.

0240 Storage

38799 **(GAO/RCED—85-113) Optional development strategies for the Strategic Petroleum Reserve.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). 22 Apr 1985. 57p. US General Accounting Office, Box 6015, Gaithersburg, MD 20877. File Number TI85901761.

Report to the Chairman, Committee on Energy and Natural Resources, United States Senate.

The Strategic Petroleum Reserve (SPR) was planned to store 750 million barrels of oil by 1991. Additional costs to reach this level are estimated at $9 billion. As a deficit reduction measure, the fiscal year 1986 budget proposes an indefinite moratorium on all future SPR activities - leaving the reserve with 489 million barrels of oil. GAO analyzed the budget proposal and five optional size strategies and noted that: since the administration's proposal is less than 500 million barrels, annual Naval Petroleum Reserve (NPR) revenues, totaling about $1 billion, could be lost. This could occur because the Energy Security Act tied a minimum 500-million-barrel SPR to continued production and sale of NPR oil. Storage development savings for a 750-million-barrel reserve are relatively small - $576 million-compared to $7.6 billion in savings resulting from slowing or stopping oil purchases. Maintaining SPR facilities during a moratorium would cost about $689 million over the next 5 years. However, additional storage capacity could be added at incremental costs ranging from $6 million to $539 million for a 500-million- and 750-million-barrel reserve, respectively. The decision before the Congress on the size and fill rate of the SPR revolves very much around the value associated with the immediate need to reduce the budget deficit as contrasted with the need to pursue the objective to a 750-million-barrel reserve.

03 NATURAL GAS

0301 Reserves

REFER ALSO TO CITATION(S) 38784

0302 Geology And Exploration

REFER ALSO TO CITATION(S) 38786

38800 (GSCan-P—84-1B, pp 237-243) **Preliminary isotopic and chemical characterization of natural gas in sediments of Lac Harrington, Quebec and Golden Lake, Ontario.** Edwards, T.W.D. (Waterloo Univ., Ontario (Canada). Dept. of Earth Sciences); Klassen, R.A. (Geological Survey of Canada, Ottawa, Ontario). 1984. NTIS (US Sales Only), PC A19/MF A01. File Number DE85781279.

In Current research: Part B.

Gases comprise up to 70 percent by volume (at 1 atmosphere) of bottom sediments in Lac Harrington, Quebec, and Golden Lake, Ontario. Stratigraphic variations in the concentration, and in the chemical and isotopic composition, of gas extracted from the bottom sediments of the two lakes are attributed to the interplay of biogenic hydrocarbon production and migrational and oxidative fractionation within the sediment columns. Nitrogen and methane constitute over 95 percent of the gases in ratios (N_2:CH_4) that range from 0.6:1 to greater than 19:1. Primary, unaltered methane in both lakes is considered to have a methane-delta ^{13}C value of about -64 per thousand (PDB), although measured values range from -65.6 per thousand to -30.3 per thousand as a result of the effects of migrational depletion and oxidative enrichment, respectively.

0305 Health And Safety

38801 (PB—85-198422/XAB) **Dispersal of LNG (liquefied natural gas) vapor clouds with water spray curtains. Phase 2: wind tunnel and small-scale spill tests. Appendix C. Model study of liquefied natural gas vapor cloud dispersion with water-spray curtains. Final report, December 1981-November 1983.** Heskestad, G.; Meroney, R.N.; Kothari, K.M.; Neff, D.N.; Andreiev, G. (Factory Mutual Research Corp., Norwood, MA (USA)). Mar 1983. 232p. NTIS, PC A11/MF A01.

See also PB84-153881, and PB85-192292. Also pub. as Colorado State Univ., Fort Collins. Dept. of Civil Engineering. rept. no. CER82-83RNM-KMK-DEN-GA41.

The report describes Phase 2 of a research program to develop engineering design guidelines for the use of water spray curtains to disperse liquefied natural gas vapor clouds. Parametric experiments were conducted on model scale in a wind tunnel on the interaction of water sprays with simulated LNG vapor overflowing a 60m x 60m diked area. In addition, a few outdoor experiments with spray curtains were run, spilling LNG into a 3m x 3m diked area. Tests recently completed by the (British) Health and Safety Executive were also analyzed. Spray curtains with both upward and downward sprays were effective. Downward sprays had to be inclined toward the vapor source to be effective when the ground flow of vapor was dense. Spray curtain configurations tested, both upward and downward-inclined, reduced volumetric vapor concentrations downwind of the 60m x 60m dike model in the wind tunnel to well under 5%. A preliminary design guide has been drafted although the technical data base is inadequate.

0306 Marketing And Economics

REFER ALSO TO CITATION(S) 38796, 39414, 39452

38802 (GRI—84/0187) **Factors affecting the competitive position of natural gas in industrial process heat applications.** Desai, T.M.; Salama, S.Y.; Duleep, K.G.; Venkateshwara, B.; Forshay, P.H. (Energy and Environmental Analysis, Inc., Arlington, VA (USA)). Sep 1984. 178p. NTIS, PC A09/MF A01. File Number TI85901417.

Gas use in industrial process heat market is expected to face increased competition from technologies based on alternate energy sources. The diversity in process heat applications makes it necessary to examine industrial process heating at a disaggregated level to assess the competition faced by gas technologies and to explore R and D concepts to improve gas competitiveness. Thirty-eight subcategories have been developed, each with common technology competition issues. The energy and natural gas consumptions in each of these subcategories are estimated. The competition faced by gas technologies from electric and coal technologies is assessed and each subcategory is classified as safe, uncertain, or vulnerable based on the degree of competition. The natural gas consumption for process heat is divided between the three classifications as follows: 41% as safe, 26% as uncertain, and 33% as vulnerable. Issues affecting the selection of gas versus oil and trends influencing gas consumption are addressed whenever relevant. 85 refs., 2 figs., 53 tabs.

0309 Artificial Stimulation

REFER ALSO TO CITATION(S) 38791

38803 (DOE/MC/21153—1870) **Further development of a fracture model for lenticular gas sands. Final report.** Palmer, I.D.; Luiskutty, C.T. (Oral Roberts Univ., Tulsa, OK (USA)). Apr 1985. Contract AC21-84MC21153. 76p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85013604.

The existing model for hydraulic fracture propagation is modified to incorporate a correction for the effect of vertical flow. The vertical flow component should be taken into consideration when the stress contrasts between the payzone and the bounding zones are not very high. To solve for fracture expansion in this situation, first solutions for a line crack expanding through uniform stress region, and then for a line crack expanding through a medium with stress contrast are obtained. The second solution is a relation between the pressure at the center of a vertical section, the half height of the section, and the rate of vertical expansion in that section. The solution represents a first-order correction for the effect of finite fluid flow in the vertical direction. The manner in which this solution is adopted in the simulator is described. The simulator is restricted to the case of symmetric stress contrast, and for a Newtonian fluid flow with no leakoff. The correction is an approximate one under the assumption that the vertical expansion is slow, andl this gives an upper limit for the wellbore height. When the vertical flow is taken into consideration, the height growth will be smaller than the one without the vertical flow. To illustrate the effect of the correction term, we have shown the results obtained for a set of parameters with and without the correction. We have also compared our results with those obtained from the P3DH model developed at MIT. In the one case we compared, we found discrepancies, and explained the reasons for these. After compensating for these discrepancies, we find reasonable agreement between the results of the ORU and MIT models. 11 refs., 6 figs., 5 tabs.

38804 (PB—85-192235/XAB) **Hydrologic characterization of coal seams for methane recovery - Activity 2 topical report: hydrologic constraints and single-phase test procedures. Volume 2. Selected methods for well-test analysis. Final report, March-June 1983.** Way, S.C.; Koenig, R.A.; McKee, C.R.; Reverand, J.M.; Ward, W.P. (In-Situ, Inc., Laramie, WY (USA)). Mar 1985. 123p. NTIS, PC A06/MF A01.

See also PB85-174902.

Volume 2 is a compendium of methods for analysis of single-phase well tests particularly applicable to coalbed methane reservoirs. Based on known hydrologic characteristics of coal seams of interest in the Piceance, San Juan, and Warrior basins, fifteen methods for well-test analysis were selected. Each method is described and its use illustrated to provide a means for designing and analyzing well tests in coal seams.

38805 **(PB—85-199644/XAB) Development and evaluation of technology for methane production from a deep coal seam in the Piceance Basin. Annual report, April 15, 1983-May 31, 1984.** Wiman, S.K.; Logan, T.L.; Seccombe, J.C.; Decker, A.D. (Resource Enterprises, Inc., Grand Junction, CO (USA)). Jun 1984. 323p. (AR—83/84-1). NTIS, PC A14/MF A01.

The Red Mountain Site, leased and operated by Resource Enterprises, Inc. is the focus of a six year, multi-well project with a main objective to develop, improve, evaluate, and communicate the technology required to produce gas from deeply buried coal. To understand the parameters controlling coalbed gas production, project efforts are focused on a single coal reservoir (the Cameo Coal D Seam) at the test site. The 2197-acre Red Mountain Site is located in the southeastern portion of the Piceance Basin in Township 9 South, Range 94 West, Mesa County, Colorado. One well was drilled at the Site this year, the 1 Deep Seam 32-2. The objective of the first well was to determine gas content and maximize core recovery. The primary objective of the next well, 2 Deep Seam 30-4, will be determination of reservoir permeability.

0330 Properties

38806 **(PB—85-198430/XAB) Development of a prototype energy meter. Final report, November 1982-August 1984.** Johnson, J.E.; Magott, R.J.; Wood, C.M. (Southwest Research Inst., San Antonio, TX (USA)). Aug 1984. 78p. NTIS, PC A05/MF A01.

A pre-production prototype energy meter has been developed for determining the gross heating value of natural gas mixtures to an accuracy of 2%. The unit is small, does not rely on a combustion process, and can be produced at a cost that is substantially below existing energy metering systems. This development program has shown that dielectric-constant measurements can be used to infer energy content; however, compensation techniques are needed to correct the dielectric readings for the effects of non-hydrocarbon diluent gases. A unique column separator has been developed for a compensation device. Meter control functions and computational needs are provided by a small-scale microprocessor system.

38807 **(PB—85-198471/XAB) Thermophysical properties of fluids for the gas industry. Annual report, January-December 1984.** Hanley, H.J.M. (National Bureau of Standards, Boulder, CO (USA). Chemical Engineering Science Div.). 22 Apr 1985. 201p. NTIS, PC A10/MF A01.

See also PB84-189109.

Work carried out in the Fluid Properties Group, National Bureau of Standards, Boulder, supported by the Gas Research Institute is discussed. Results obtained in the calendar year 1984 are outlined. The most important are: viscosity data for gaseous and liquid CO_2; fugacity data on H_2 mixtures; and theoretical studies on mixing rules and local composition. The overall philosophy and technical resources of the group are discussed. Plans for the future are noted.

0340 Combustion

38808 **(PB—85-198414/XAB) Improved oxygen-separator development program. Topical report, December 1982-April 1983.** Bansal, R.K.; McCombs, N.R.; Carmen, J.R. (XORBOX, Tonawanda, NY (USA)). May 1983. 57p. NTIS, PC A04/MF A01.

This report describes in detail the activities and accomplishments of work performed during Phase I of the development program. The three-phase development program aimed at reducing the cost of oxygen generation is scheduled for completion in May, 1984. Applications for the system under development include oxy-fuel burners for melting and oxygen enrichment of gas-fired furnaces for industrial heating. A survey of all the known methods of oxygen generation resulted in the selection of single-bed pressure swing adsorption (PSA) process as potentially the lowest-cost method. Therefore, all the program efforts have been concentrated on the development of single-bed PSA process. The Phase I work described in this report consisted of parametric and laboratory evaluation of both (i) the atmospheric and (ii) the vacuum-assisted single-bed PSA concepts. The major conclusion drawn from the experimental work performed is that the single-bed vacuum assisted PSA process stands out as the best overall among the processes tested. It has definite potential for generating oxygen at about half the cost compared to state-of-the-art PSA systems. Process and mechanical design of full scale prototype (Phase II) is presently underway. The final assembly and field testing of the prototype (Phase III) is scheduled for the first quarter of 1984.

04 OIL SHALES AND TAR SANDS

38809 **(DOE/FE/60177—1881) Oil shales, tar sands, and underground coal gasification. Quarterly technical progress report, October-December 1984.** (Western Research Inst., Laramie, WY (USA)). 15 Feb 1985. Contract FC21-83FE60177. 67p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85009913.

Progress is reported for the quarter ending December 1984. The report is divided into 3 sections: oil shale, tar sand, and underground gasification. Recovery processes, novel concepts, and environmental impact mitigation have been investigated for each of the above energy sources. Physical/chemical properties of oil shales are also included. Separate abstracts have been prepared for each section for inclusion in the Energy Data Base. (DMC)

0403 Drilling, Fracturing, And Mining

REFER ALSO TO CITATION(S) 38814

0404 Oil Production, Recovery, And Refining

38810 (CONF-840465—Vol.1, pp 289-300) **Methods of enhancing fluid communication in oil sands.** Tam, E.S.; Edmunds, N.R.; Redford, D.A. 1984. Society of Petroleum Engineers, 6200 N. Central Expwy., P.O. Drawer 64706, Dallas, TX 75206. File Number TI85005548.

From 4. SPE/DOE symposium on enhanced oil recovery; Tulsa, OK, USA (16 Apr 1984).

Effective steamflooding of oil sands requires fluid communication between injectors and producers. In this study numerical simulation was used to develop a communication enhancement process which involves the stimulation of production wells with hot water followed by hot water injection into the injection well. A reservoir description was assumed with initial mobility such that a steam drive process could not be started readily. Results of the study indicate that the communication path can be heated gradually using production wellbore stimulation and hot water injection. However, the process is not effective for low mobility zones. In the latter case organic solvents may be used to enhance the process. The study generally outlines the range of permeability thicknesses for which hot water can be used as an enhancement agent. The possibility of using CO_2 as a viscosity reduction agent was also considered. Results show that CO_2 injection cannot attain mobile conditions for the bitumen unless the reservoir pressure is sufficiently high. On the other hand, CO_2 has an adverse effect on water injectivity; CO_2 is not recommended as a communication enhancement agent unless sufficient high injection pressure is used.

38811 (DOE/FE/60177—1881, pp 1.1-1.30) **Oil shale.** 15 Feb 1984. NTIS, PC A04/MF A01. File Number DE85009913.

In Oil shales, tar sands, and underground coal gasification. Quarterly technical progress report, October-December 1984.

Progress is reported in the oil shale task in physical/chemical properties, in situ processes, novel concepts, and environmental research. Reaction rates for decomposition of kerogen in Green River oil shale have been measured in experiments in three different reactors. Products from extractions of Green River oil shale contain as much as 20% sodium carboxylates. Heavy shale oil fractions have been exposed to liquid-phase coking conditions for residence times of 17-39 minutes at isothermal temperatures of 400°F and 500°F. Compaction of 30 gpt oil shale during retorting under a me-

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chanical load of 100 psi fills about 50% of the original 12% void volume in the shale bed. Analysis of corresponding gas tracer tests in the 10-ton retort have identified the dimensionless peak arrival time of tracer gas as a good predictor of sweep efficiency. Oil yields predicted by the one-dimensional retorting model show good agreement with the experimental measurements in three of the non-uniform flow distribution tests. Results of an extraction experiment to determine whether or not pyridine solvent or its decomposition fragments are incorporated in organic matter extracted from Green River shale indicate that pyridine is not present. No significant increase in bitumen has been observed by treatment of Green River oil shale with radical-forming reagents. In an evaluation of digestion methods for determining trace metal content, sodium peroxide fusion of ashed raw oil shale has been found to be the method giving the most reliable results. The trace element bibliographic data base is complete and available to interested researchers. Five oil shale process waters have been characterized by fractionation with GC analysis to produce profiles that are useful in evaluating envionmental transport processes. 7 refs., 4 figs., 3 tabs.

38812 (DOE/FE/60177—1881, pp 2.1-2.16) **Tar sand.** 15 Feb 1984. NTIS, PC A04/MF A01. File Number DE85009913.

In Oil shales, tar sands, and underground coal gasification. Quarterly technical progress report, October-December 1984.

Progress is reported in tar sand research. Preheating of packed tar sand to 300°F avoids plugging during hot-gas pyrolysis of the bitumen to produce oil. Future experiments are planned to measure the recovery and properties of the product oil when the hot-gas pyrolysis is propagated through an entire length of preheated tar sand. Two block reactor shake-down tests of steam injection in consolidated tar sand have revealed problems in sealing the samples. The equipment and procedures are being modified to resolve these problems. Oils produced by reverse combustion of tar sand in the tube reactor were significantly upgraded in quality. Residue (1000°F+) decreased from 60% for the bitumen to the range of 4-30% for the product oils. Trace element compositions for 14 US tar sand bitumens were determined. Concentrations for 31 elements are reported. Two comprehensive reports on the geology of the PR Spring and Northwest Asphalt Ridge, Utah, tar sand deposits are being reviewed prior to publication. A literature survey is in progress on potential novel approaches for recovery of bitumen from US tar sands. An analysis of effluent residual particle concentration yielded determinations regarding the efficiencies of various particle removal methods. The methods in decreasing order of efficiency are polymer-aided air flotation and activated carbon adsorption, coagulation and activated carbon adsorption, and coagulation. Toxicity tests are currently under way on raw TS-1S process water and seven treated TS-1S waters. Results from Microtox tests show that the majority of the toxicity is contained in solution rather than as emulsions. Literature on high clay wastewater reveals that Canadian wastewater settling problems may be associated with kaolinite and illite. WRI previously identified kaolinite in the Asphalt Ridge deposit. 1 fig., 7 tabs.

38813 (DOE/FE/60194—T1) **Application of solvent hydrogen donor process for the conversion of eastern oil shales. Final progress report, October 1, 1982-December 31, 1984.** Cronauer, D.C.; Solash, J. (Gulf Research and Development Co., Pittsburgh, PA (USA)). Jun 1985. Contract AC01-82FE60194. 254p. NTIS, PC A12/MF A01; 1; GPO Dep. File Number DE85014954.

The overall objective of this project was to develop an understanding of the fundamentals of a solvent hydrogen donor process to convert kerogen in eastern US shales to useful products. The goals were to determine the effect of donor content on conversion, changes in kerogen and products with conversion conditions, and the fate of the donor solvent including material balances with losses through isomerization, adduction reaction, and physical retention in the rock matrix. In particular, the project was divided into: (1) characterizing the kerogen of two samples of eastern US shale, (2) hydrogen donor conversion of these shales using model solvents of varying donor content, and (3) characterizing the unreacted kerogen and liquid products. Progress is reported in each of the above tasks. The results of reduced alkylation concentration reveal that this kerogen is more like coal than Green River oil shale kerogen. Hydrogen donor solvents play a significant role in converting both Hilpat and Indiana shales to liquid products. A sizable level of solvent dimerization and adduction (combination reactions with shale-derived species) reactions also occur. The distribution of yields in the donor solvent conversion of shale was studied using a cascade reactor system with shale injection into a preheated reactor. Analytical techniques were used to characterize the products. 51 figs., 33 tabs.

38814 (DOE/METC—85/4001) **Modeling efforts within the DOE Oil Shale Program.** Bartke, T.C. (USDOE Morgantown Energy Technology Center, WV). Jan 1985. 27p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85003351.

This technical note is an overview of mathematical modeling efforts in the Department of Energy Oil Shale Program and includes a bibliography of modeling related to oil shale processing. Process modeling is a tool employed by the Morgantown Energy Technology Center in their systems analysis approach to Oil Shale research management. Through a process of model development, empirical data generation, and cataloging, program managers are able to develop comprehensive overviews of their programs and redefine/redirect program efforts to more effectively reach their goals and objectives. Models covering rock fragmentation, void characterization (tracer studies), chemistry and physics of retorting, and more specialized areas have been developed by and are in use at several national laboratories government centers, and universities. The models are listed with observations regarding application, code language, ease of use, reliability, and documentation.

0405 Properties And Composition

REFER ALSO TO CITATION(S) 38811, 38812, 38813

38815 (DOE/FE/60177—1897) **Nitrogen compound types in hydrotreated shale oils.** Holmes, S.A. (Western Research Inst., Laramie, WY (USA)). Apr 1985. Contract FC21-83FE60177. 33p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015755.

The nitrogen content of retorted shale oils needs to be reduced if the oils are to be used as transportation fuels. The nitrogen compound-type compositions in oils and fuels are dependent on shale source as well as on upgrading conditions. The identification of the nitrogen-containing species in shale oil aids in understanding the effects of fuel processing and fuel stability. This research is directed towards examining the nitrogen-type distribution in several oils and fuels. Nitrogen compound distributions in retorted, hydrotreated, and acid-clay-treated shale oils have been determined from data obtained by nuclear magnetic resonance (NMR) and mass spectrometry, infrared spectroscopy, alumina/silica adsorption chromatography, gas chromatography, and potentiometric titration. Catalytic hydrotreated oils contained alkyl-substituted pyridines, anilines, indoles, carbazoles, quinolines, and tetrahydroquinolines, predominantly 1,2,3,4 tetrahydroquinoline. Different hydrodenitrogenation reactivities were determined for different nitrogen compound types. Less reactive compound types such as sterically hindered alkylpyridines and nonbasic alkylindoles/carbazoles were found in oils that had undergone moderate hydrotreating conditions. The deleterious effects of certain nitrogen compounds on fuel storage stability and thermal oxidation are well known. Acid and clay selectively removed basic nitrogen from hydrotreated shale oils. Carbazole and alkyl-substituted carbazoles were the only nitrogen species present in the acid-clay-treated (finished) fuel from shale oil. Based upon model compound studies, these nitrogen species are not expected to be problematic for fuel storage. 19 refs., 5 figs. 8 tabs.

38816 (SAND—85-1372C) **Modeling of rock fracture/rock motion.** Gorham-Bergeron, E. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 11p. (CONF-850761—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85013952.

From 1. annual tar sand/oil shale contractors' meeting; Morgantown, WV, USA (9 Jul 1985).

The principal objective of the Rock Fragmentation Research Program is to develop the capability to predict (with modeling) the

characteristics of the retort that determine yield as a function of the blast design and the site properties. The development of modeling as a predictive method was chosen primarily to reduce the cost of evaluating retort designs. It could also result in a more flexible tool than design evaluation by field testing. Presently the rock fragmentation modeling consists of calculating the initial explosive fracturing using the dynamic, finite element code, DYNA2D, coupled with a (subsequent) rock motion calculation using a discrete element code, CAROM. DYNA2D calculates explosive performance in the blastwell, shock wave propagation through the material, and material fracturing and initial movement including blastwell expansion). CAROM uses the velocity field, the blasthole pressure, and the fracture zone predicted by DYNA2D to calculate the subsequent motion of the fractured rock. Key achievements are summarized. A new fracture model has been developed and incorporated into DYNA2D. Fracturing calculations using layered rock, a much more accurate description of oil shale, are now being used and show better predictions of overall degree of fracturing than isotropic calculations. The importance of using cores rather than crater size to determine fracture extent has been demonstrated. Analysis of fragmentation tests SB-1 and SB-2 show good agreement between DYNA2D predictions and experimental measurements for stress wave arrival time and initial magnitude and initial material velocity field. Comparisons between experimental measurements and CAROM predictions of initial material motion show good agreement. CAROM predictions of excavated crater profiles agree well with those measured for SB-1 and SB-2. 11 figs., 3 tabs.

38817 **(UCRL—92192) Inorganic nitrogen in Green River formation oil shale.** Taylor, R.W.; Burnham, A.K.; Smith, G.S.; Sanborn, R.H.; Gregory, L.S. (Lawrence Livermore National Lab., CA (USA)). May 1985. Contract W-7405-ENG-48. 15p. (CONF-850942—17). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013977.

From 190. American Chemical Society national meeting; Chicago, IL, USA (8 Sep 1985).

Inorganic (mineral) nitrogen has been found in both raw and retorted Green River Formation oil shale. Buddingtonite, an ammonium-bearing feldspar, has been identified in some shales by x-ray diffraction, and the ammonium ion (NH_4^+) has been found in the same and other shale by infrared adsorption. Measurement of total nitrogen content of low-temperature ashed oil shale by a combustion technique is proposed as a method of measuring inorganic-nitrogen content. The method is based on the observation that the nitrogen content of buddingtonite is not reduced by low temperature ashing. Use of this technique demonstrates that inorganic nitrogen content is variable and is the major source of nitrogen in some oil shale samples. The fate of both organic and inorganic nitrogen during pyrolysis is also discussed. 20 refs., 7 figs., 5 tabs.

0407 Health And Safety

REFER ALSO TO CITATION(S) 38818

0410 Environmental Aspects

REFER ALSO TO CITATION(S) 38811, 38812

38818 **(LA-UR—85-2273) Los Alamos environmental activities/oil shale effluents.** Peterson, E.J. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 13p. (CONF-850761—5). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014071.

From 1. annual tar sand/oil shale contractors' meeting; Morgantown, WV, USA (9 Jul 1985).

The objectives of this research are to determine the nature, magnitude, and time dependence of the major and trace element releases as functions of the raw shale mineralogy, retorting conditions, and spent shale mineral assemblages. These experimental studies will focus on retorting variable regimes characteristic of most retorting processes. As an adjunct objective, the relation of laboratory results to those obtained from both bench-scale and pilot-scale retorts, when both have been operated under similar retorting conditions, will be defined. The goal is to develop a predictive capability for spent shale chemistry as a function of the raw material feedstock and process parameters. Key accomplishments follow: completed an overview of health, environmental effects, and potential "show stoppers" in oil shale development; elucidated the importance of both raw material and process in the identity and behavior of spent shale wastes (Occidental raw and spent shales from the Logan Wash site); completed a balanced factorial design experiment to investigate the influence of shale type, temperature, and atmosphere on spent shale behavior; compared the behavior of spent shales from laboratory experiments with shales generated from MIS retorting by OOSI at Logan Wash, Colorado; completed a study of the partitioning of minerals, inorganics, and organics as a function of particle size in a raw shale from Anvil Points, Colorado; evaluated the application of the Los Alamos nuclear microprobe to the characterization of trace element residences in shale materials; established the use of chemometrics as a major tool for evaluating large data bases in oil shale research and for relating field and laboratory results; conceptualized and evaluated experimentally a multistaged leaching control for abandonment of underground retorts; and coordinated activities with other DOE laboratories, industry laboratories, and universities. 13 refs., 1 fig., 2 tabs.

05 NUCLEAR FUELS

0501 Reserves

REFER ALSO TO CITATION(S) 38826

38819 (GSCan-P—83-1A, pp 1-14) **Some chemical aspects of the regolithic and hydrothermal alterations associated with the uranium mineralization in the Athabasca basin, Saskatchewan.** Tremblay, L.P. 1983. NTIS (US Sales Only), PC A22/MF A01. File Number DE85781277.

In Current research: Part A.

Chemical analyses were carried out on 45 pairs of whole-rock samples from intensely altered and less altered basement in the vicinity of the major known unconformity-type uranium deposits in Saskatchewan. The results indicate that magnesia was depleted when the rocks underwent regolithic alteration and was later added when the rocks were altered by the mineralizing solutions, that is, when the uranium deposits were formed after deposition of the Athabasca rocks. Other chemical changes indicated are an apparent decrease in silica and an apparent increase in alumina, water, TiO_2 and, in most locations potash. Soda appears to have been removed completely. The above changes should be taken as trends only. These trends also remained when the data were treated with Al_2O_3 concentrations assumed to be constant.

38820 (GSCan-P—83-1A, pp 109-119) **Uranium and thorium distribution patterns and lithogeochemistry of Devonian granites in the Chedabucto Bay area, Nova Scotia.** Ford, K.L.; Ballantyne, S.B. 1983. NTIS (US Sales Only), PC A22/MF A01. File Number DE85781277.

In Current research: Part A.

Follow-up investigations of airborne gamma ray spectrometric surveys confirmed the elevated levels of uranium and high eU/eTh ratios in some phases of the Devonian peraluminous granites of the Chedabucto Bay area. The high eU/eTh ratio is the result of increasing levels of uranium and/or decreasing levels of thorium associated with increasing differentiation. Limited surficial geochemical sampling failed to distinguish two radiometrically distinct granites (Sangster Lake and Eastern Brook). The fact that uranium is not concentrated in either the aqueous or surficial sedimentary environment suggests that it may be in a non-labile form. Lithogeochemical sampling indicated that some of the Chedabucto Bay granites are in the 'specialized' granite class of Tischendorf. Characteristics of increased differentiation and/or autometasomatic alteration were best shown by enrichment of U, Be, Sn, Nb, and Rb, depletion of TiO_2, MgO, CaO, Sr, Ba, and Th, and on increasing Na_2O/K_2O ratio. An albitized cassiterite-bearing granitic dyke was found to exhibit these characteristics. Other granite phases showing some characteristics of increased differentiation (high eU/eTh) have high background levels of particular lithophile elements such as Sn and Be. These may be examples of 'precursors' to mineralization.

38821 (GSCan-P—83-1A, pp 449-456) **Progress report: uranium-phosphorus association in the Helikian Thelon formation and sub-Thelon saprolite, central District of Keewatin.** Miller, A.R. 1983. NTIS (US Sales Only), PC A22/MF A01. File Number DE85781277.

In Current research: Part A.

Phosphate-cemented uranium-bearing lithologies in the Helikian Thelon Formation occur predominantly in the basal fluvial clastics but also as vein systems in the sub-Thelon saprolitic basement complex. Fluorapatite, with or without goyazite, illite and hematite are the principal mineralizing phases. Variable but anomalous concentrations of B, Ba, Li, Rb and Sr in phosphate-cemented sediments are similar to elements enriched during evaporation of modern saline lakes. Phosphate in the Thelon Formation may have been generated in continental, ephemeral, saline lakes but migrated into strata to or vertically below the site of origin. One isotopic age date suggests a minimum age for phosphate cementation at approximately 1660 Ma.

38822 (GSCan-P—83-1B, pp 291-297) **Age and origin of pitchblende from the Gunnar Deposit, Saskatchewan.** Gandhi, S.S. 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781278.

In Current research: Part B.

The host rock of the Gunnar uranium deposit is an Aphebian granite gneiss which is strongly albitized near the ore zone. Albitization, fracturing and brecciation of the albitized rocks and initial uranium deposition from alkaline carbonate-rich solutions occurred most probably during late Aphebian time. The U-Pb isotopic dates on pitchblendes from the Gunnar deposit, however, are close to 1000 Ma, and are interpreted to represent a substantial modification of the older uranium mineralization by supergene processes.

38823 (GSCan-P—83-1B, pp 23-37) **Selected mineral associations in radioactive occurences in the Grenville structural province. A progress report.** Rimsaite, J. 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781278.

In Current research: Part B.

The following mineral associations in leucocratic, melanocratic and mylonitic ore from Bancroft area, Ontartio, and radioactive rocks from Mont-Laurier and Baie-Johan Beetz areas, Quebec, are described and related to petrography and evolution of the host rocks: 1. uranium, thorium and rare earth element (REE)-bearing mineral associations in a single grain; 2. accumulations of radioactive ore minerals as intergrowths with accessory minerals in or adjacent to ferromagnesian minerals; 3. evolution of REE minerals with changing La/Ce ratio, and the relationship between U, Th and REE minerals; 4. associations of primary and secondary minerals within altered radioactive ore and accessory minerals; 5. radioactive and REE mineral associations in mylonitized quartz-rich rocks. Studies of these mineral associations and their textures have suggested possible physicochemical environments of crystallization, mobilization and redeposition of radioactive and REE minerals. These data contribute to a better understanding of radionuclide behaviour in radioactive occurrences including uranium mill tailings and other nuclear wastes.

38824 (GSCan-P—83-1B, pp 93-108) **Mineralogical, petrochemical and petrographic-textural studies of ore grade and lower grade radioactive rocks from the Bancroft area, Ontario. Progress report 2.** Rimsaite, J. 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781278.

In Current research: Part B.

Results of rapid chemical, spectrographic, scanning electron microscope and neutron activation analyses for U are discussed in relation to metamorphism, recrystallization, replacement textures and mineralization of hybrid rocks collected at mine sites in the Bancroft area. The samples represent the following: 1. gneisses, migmatites and granitoid rocks in and adjacent to the Faraday granite; 2. Cheddar granite, mylonite and surrounding gneisses with sedimentary textures; 3. pegmatite and adjacent high grade metamorphic rocks surrounding Halo mine; 4. selected ore specimens from the Madawaska, Greyhawk, Bicroft and Halo mines, and their relation to petrographic-textural characteristics and ore and accessory mineral associations. Relicts of diverse metasedimentary rocks, prophyroblastic and anatectic textures, impregnations, mylonitiation and alteration account for the mineralogical and petrochemical diversity of the hybrid rocks. With a few exceptions which contain radioactive accessory minerals, most of the metasediments contains less than 4 ppm U and are unlikely sources for the uranium mineralization.

38825 (GSCan-P—83-1B, pp 317-326) **Origin of pitchblende veins in the Union Island area, Great Slave Lake, Northwest Territories.** Gandhi, S.S. 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781278.

In Current research: Part B.

Pitchblende veins are sparsely distributed in an 8 x 1 km zone of northeast-trending, steeply dipping Aphebian sedimentary rocks deposited on Archean granitic basement and affected by complex faulting. They occur in brecciated dolomite of the Union Island Group on the east shore of Union Island, and along fractures subsidiary to a nearly vertical, northeast-trending fault between phyllites of this group and arkosic quartzite of the younger Sosan Group, which is exposed for a distance of 4 km on Opener Island to the east. The veins are close to the unconformity between the host rocks and the younger, gently dipping clastic redbeds of the Late Aphebian Et-Then Group, which most probably covered the mineralized zone at one time. A supergene origin for the veins is proposed on the basis of geological setting, mineralogy, presence of Ag, Se and V, isotopic dates on pitchblende, and lack of evidence for alternative magmatic or metamorphic hydrothermal sources.

0502 Exploration

REFER ALSO TO CITATION(S) 40341

38826 **(DOE/OR/00033—T102) Implications of the geology and geochemistry of the Maclean Five uranium deposit, Three Rivers, Texas.** Cathey, W.B. (Oak Ridge Associated Universities, Inc., TN (USA)). Jun 1980. Contract AC05-76OR00033. 140p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE85015015.

The Maclean Five uranium deposit is an unusual "dike-like" accumulation of uranium and molybdenum minerals in the Miocene fluvial Oakville Sandstone, along a down-to-coast normal fault that displaces both the Catahoula and Oakville Formations. The fault-related configuration of these ores presents a marked contrast with adjacent rollfront and tabular deposits to the north. Petrographic analysis of the barren host rock reveals a composition including 17.3% limestone rock fragments (LRF's), 22.2% volcanic rock fragments (VRF's), and 19.4% calcite cement. X-ray diffraction and electron microprobe analyses indicate the ore assemblage to be predominantly uraninite and coffinite, with subordinate sphalerite and marcasite. Neutron activation analysis data establish that elements fixed in inherent host rock minerals are pseudonormally or normally distributed, whereas elements associated with uranium are log-normally distributed. Depth-concentration plots show three vertical zones of uranium enrichment. Uranium in the core samples displays highly significant positive correlations with Mo and As. The proposed "fault-trap" model of ore formation includes three phases: (1) dissolution of pre-existing mineralized bodies in response to weathering and stream erosion; (2) discharge of uraniferous carbonate solutions to a restricted fault zone; (3) precipitation of calcite within the microenvironments of pre-existing cement and deposition of ore-stage minerals, due to sharp, local reductions in pH. Eh remains relatively constant at the fault zone due to a continual influx of reducing gases from hydrocarbon deposits at depth. Narrow linear anomalies of U, Mo, and As in geochemical sampling media should serve as potential pathfinders for this deposit-type. 52 refs., 32 figs., 17 tabs.

38827 (GSCan-P—83-1A, pp 277-284) **Recognition of uranium concentration processes in granites and related rocks using airborne radiometric measurements.** Maurice, Y.T.; Charbonneau, B.W. 1983. NTIS (US Sales Only), PC A22/MF A01. File Number DE85781277.

In Current research: Part A.

A method of recognizing granites and related rocks, which have been subjected to magmatic or post-magmatic radioelement concentration processes, is described. The technique utilizes the eU and eTh signatures of the rocks and their ratio from airborne radio-

metric profiles. Examples are given for unmineralized granites (north of Elliot Lake, Ontario), granites that have undergone post-magmatic remobilization of their uranium (Fury and Hecla Strait, NWT) and differentiated plutons which contain concentrations of radioelements in the late differentiates (Blachford Lake complex, NWT) and South Mountain Batholith, Nova Scotia.

38828 **(INIS-mf—9307) Studies on precambrian granites and sedimentary rocks by means of the fission track method and alpha spectrometry.** Vorwerk, R. (Koeln Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 16 Jul 1983. 112p. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781415.

Samples of granites and sedimentary rock from the Kaap Valley in South Africa were studied for the microdistribution of U and Th by means of fission track mapping and α spectrometry. A Ra 226 anomaly was found which could not be explained by a strong loss of U. New findings were gained when studying U distribution patterns in the granites.

0503 Mining

REFER ALSO TO CITATION(S) 38953, 38956, 39399

38829 **(INIS-mf—9732) Decree 3322/1971 of 23 December on the purposes of the National Uranium Enterprise.** (International Atomic Energy Agency, Vienna (Austria)). 18 Jan 1972. 1p. (In Spanish). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781510.

Published in the Boletin Official del Estado.

This Decree determines the purposes of the National Uranium Enterprise set up by a Decree of 22 February 1969. In collaboration with the Junta de Energia Nuclear, the Enterprise will in particular work uranium deposits, produce uranium concentrates, enrich uranium, manufacture fuel elements, process nuclear fuel and engage in the trade of the products obtained. (NEA).

0504 Feed Processing

REFER ALSO TO CITATION(S) 38829

38830 **(NUCLEBRAS-CDTN—474) Flotation of phosphorous-uraniferous minerals from Itataia.** Aquino, J.A. de. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). 1984. 39p. (In Portuguese). (CONF-8405314—1). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781076.

From 10. Brazilian meeting on ore treatment and hydrometallurgy; Belo Horizonte, MG, Brazil (23 May 1984).

Experimental conditions were established, in laboratory and pilot scales, for the flotation of a sample of a phosphorus-uraniferous mineral from Itataia mines (CE, Brazil), basically composed of apatite and calcite. Laboratory investigations led to the optimization of the most important flotation variables and of the reagents system (tall-oil, collamil and sodium silicate) in the roughing, scavenging and cleaning steps of the process. In pilot scale, flowsheet tests were performed under the same conditions proposed for laboratory studies. The optimization of laboratory conditions led to the following yields: 29.3% of P_2O_5 concentrates and 73.5% P_2O_5 recovery. In the pilot scale tests, 28.4% of P_2O_5 concentrates and 76.7% P_2O_5 recovery yields were obtained.

38831 **(NUCLEBRAS-CDTN—476) Process for uranium recovery in phosphoric acid.** Duarte Neto, J. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). 1984. 19p. (In Portuguese). (CONF-8405314—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781077.

From 10. Brazilian meeting on ore treatment and hydrometallurgy; Belo Horizonte, MG, Brazil (23 May 1984).

Results are presented about studies carried out envisaging the development of a process for uranium recovery from phosphoric acid, produced from the concentrate obtained from phosphorus-uraniferous mineral from Itataia mines (CE, Brazil). This process uses a mixture of DEPA-TOPO as extractant and the extraction cycle involves the following stages: acid pre-treatment; adjustment of the oxidation potential so to ensure that all uranium is hexavalent; extraction of uranium from the acid; screening of the solvent to remove undesirable impurities; uranium re-extraction and precipitation; solvent recovery. A micro-pilot plant for continuous processing was built up. Data collected showed that uranium can be recovered with an yield greater than 99%, thus proving the feasibility of the process and encouraging the construction of a bigger scale plant.

38832 **(NUCLEBRAS-CDTN—477) Uranium extraction in phosphoric acid.** Araujo Figueiredo, C. de; Duarte Neto, J. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). 1984. 34p. (In Portuguese). (CONF-8405314—3). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781078.

From 10. Brazilian meeting on ore treatment and hydrometallurgy; Belo Horizonte, MG, Brazil (23 May 1984).

Uranium is recovered from the phosphoric liquor produced from the concentrate obtained from phosphorus-uraniferous mineral from Itataia mines (CE, Brazil). The proposed process consists of two extraction cycles. In the first one, uranium is reduced to its tetravalent state and then extracted by dioctylpyrophosphoric acid, diluted in Kerosene. Re-extraction is carried out with concentrated phosphoric acid containing an oxidising agent to convert uranium to its hexavalent state. This extract (from the first cycle) is submitted to the second cycle where uranium is extracted with DEPA-TOPO (di-2-hexylphosphoric acid/tri-n-octyl phosphine oxide) in Kerosene. The extract is then washed and uranium is backextracted and precipitated as commercial concentrate. The organic phase is recovered. Results from discontinuous tests were satisfactory, enabling to establish operational conditions for the performance of a continuous test in a micro-pilot plant.

38833 **By-product recovery of uranium from wet-process phosphoric acid.** Hurst, F.J.; Crouse, D.J. (Oak Ridge National Lab., Oak Ridge, TN). pp 201-224 of Actinide Recovery from Waste and Low-Grade Sources. Navratil, J.D.; Schulz, W.W. New York, NY; Harwood Academic Publishers (1982). (CONF-810899—).

From Actinide recovery symposium; New York, NY, USA (24 Aug 1981).

By-product uranium recovery from wet-process phosphoric acid reached commercial reality in the late 1970s; ten uranium recovery plants using three different solvent extraction processes came into operation, eight in the U.S., one in Belgium, and one in Canada. In 1981 about 2,000 tons of uranium or 10% of the total U.S. production was recovered at seven phosphate plants. By 1982, three of the original ten plants had ceased operation because of operating problems and a depressed uranium market. Six of the plants now operating use the DEPA-TOPO process. Since this process has received the greatest commercial acceptance, it is described in detail. Several potential improvements that can make the process more cost effective are also discussed. In addition, information on preliminary and post acid treatment that is necessary for a successful operation is included. A brief discussion of the other two commercial processes, and some alternate process schemes is also presented.

0505 Enrichment

REFER ALSO TO CITATION(S) 38829

38834 **(CONF-850926—4) Correction of compressor critical speed condition through fluid-film bearing optimization.** Spencer, J.W.; Obeid, V.E. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 1985. Contract AC05-84OT21400. 32p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85005507.

From ASME vibration and sound conference; Cincinnati, OH, USA (10 Sep 1985).

A critical speed condition for an overhung centrifugal compressor was corrected through a relatively minor bearing modification. The resonant condition was evaluated analytically through rotor dynamic analyses (stability and forced response) which in-

cluded fluid film bearing characterization and rotor model generation (experimentally evaluated by model analysis). The importance of adequate specification, inspection, and analytical characterization, of fluid film bearings are discussed. The effects of unbalance on the stability of plain journal bearings are also commented upon. 1 ref., 6 figs.

38835 **(UCID—20448) Science, technology, and the industrialization of laser-driven processes.** Davis, J.I.; Paisner, J.A. (Lawrence Livermore National Lab., CA (USA)). May 1985. Contract W-7405-ENG-48. 21p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014856.

Members of the laser program at Lawrence Livermore National Laboratory (LLNL) reviewed potential applications of lasers in industry, some of which are: isotope separation; cleanup of radioactive waste; trace impurity removal; selective chemical reactions; photochemical activation or dissociation of gases; control of combustion particulates; crystal and powder chemistry; and laser induced biochemistry. Many of these areas are currently under active study in the community. The investigation at LLNL focused on laser isotope separation of atomic uranium because of the large demand (> 1000 tonnes/year) and high product enrichment price (> $600/kg of product) for material used as fuel in commercial light-water nuclear power reactors. They also believed that once the technology was fully developed and deployed, it could be applied directly to separating many elements economically on an industrial scale. The Atomic Vapor Laser Isotope Separation (AVLIS) program at LLNL has an extensive uranium and plutonium program of >$100 M in FY85 and a minor research program for other elements. This report describes the AVLIS program conducted covering the following topics; candidate elements; separative work units; spectroscopic selectivety; major systems; facilities; integrated process model;multivariable sensitivety studies; world market; and US enrichment enterprise. 23 figs. (AT)

38836 **Rotating compressible flows with internal sources and sinks.** Wood, H.G.; Sanders, G. (Univ. of Virginia, Charlottesville). *Journal of Fluid Mechanics;* **127**: 299-313(1983). Contract W-7405-ENG-26;AC05-76OR01779.

An analysis is presented that describes a model of the flow field of a rotating compressible fluid in a cylinder with internal sources or sinks of mass, momentum or energy. A solution of the mathematical model is obtained using an expansion in eigenfunctions of the corresponding homogeneous equation. The internal sources or sinks produce countercurrent flows analogous to flows generated by boundary conditions in the classical analysis of the problem. The application of this model to the flow driven by a feed stream or a scoop is discussed. Some sample calculations are presented that illustrate the countercurrent flow produced by sources of mass, the three components of momentum, energy and a mass source/sink combination. Calculations simulating feed introduction and a tails-removal scoop have been performed and the fluid-dynamics solutions have been used to calculate the optimum separative performance of the example centrifuge. The application of this study to gas centrifuge development is described.

0507 Fuels Production And Properties

REFER ALSO TO CITATION(S) 38829

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 38901, 38952, 39677, 40887

38837 **(AESS(E)—6050) Stainless steel forgings for nuclear chemical plants.** (UKAEA Risley Nuclear Power Development Establishment). Feb 1982. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781075.

This specification covers detailed requirements for the supply of austenitic stainless steel forgings used in radioactive and corrosive areas within the Nuclear Industry. With the exception of 316S51 the materials specified are all suitable for contact with nitric acid, 316S51 being included as suitable for use in contact with sodium and other alkali metals at elevated temperatures.

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38838 **(CEA-CONF—7418) Chemistry of actinides and lanthanides. New extractants and separation methods.** Musikas, C. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). Sep 1984. 36p. (CONF-8409234—1). NTIS (US Sales Only), PC A03/MF A01. File Number DE85751945.

From International Atomic Energy Agency consultants meeting on separations in chemical analysis; Vienna, Austria (12 Sep 1984).

Basic chemistry can still open new ways for actinides separations for analytical and industrial purposes. In this paper are discussed: reprocessing of spent nuclear fuels, for which dialkylamides seem to be an advantageous alternative to TBP; extraction of actinides from the high radioactive wastes acidic nitrate solutions by N,N'dimethyldialkylmalonamides which are extractants forming lower amounts of wastes than the carbamoylmethylenephosphonates; use of nitrogen or sulfur donors extractants for trivalent actinides lanthanides group separations which permits group separations from low pH nitric acid solutions.

38839 **(CEA-CONF—7471) Development of a continuous dissolution process for the new reprocessing plants at La Hague.** Auchapt, P.; Patarin, L.; Tarnero, M. (Compagnie Generale des Matieres Nucleaires (COGEMA), Centre de Marcoule, 30 - Bagnols-sur-Ceze (France); CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). Aug 1984. 12p. (CONF-840802—26). NTIS (US Sales Only), PC A02/MF A01. File Number DE85751987.

From ANS International topical meeting on fuel reprocessing and waste management; Jackson Hole, WY, USA (26 Aug 1984).

The French Commissariat a l'Energie Atomique has designed a continuous rotary dissolver for LWR fuel reprocessing. An industrial prototype has been tested since 1979 at the Service des Prototypes Industriels, at Marcoule. This type of dissolver will be installed at the COGEMA's Reprocessing Plants at La Hague. The advantages of a continuous process are listed, compared to batch dissolutions (chemistry, operation, capacity). The industrial prototype, featuring safe geometry, is described. The R and D program is indicated, and the main results of inactive tests already performed on the industrial prototype are given, including heating, mechanical, and chemical tests (UO_2 dissolutions at 4tU per day).

38840 **(CEA-CONF—7472) Fast breeder reactor fuel reprocessing in France.** Bourgeois, M.; Le Bouhellec, J.; Eymery, R.; Viala, M. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). Aug 1984. 13p. (CONF-840802—27). NTIS (US Sales Only), PC A02/MF A01. File Number DE85751989.

From ANS International topical meeting on fuel reprocessing and waste management; Jackson Hole, WY, USA (26 Aug 1984).

Simultaneous with the effort on fast breeder reactors launched several years ago in France, equivalent investigations have been conducted on the fuel cycle, and in particular on reprocessing, which is an indispensable operation for this reactor. The Rapsodie experimental reactor was associated with the La Hague reprocessing plant AT1 (1 kg/day), which has reprocessed about one ton of fuel. The fuel from the Phenix demonstration reactor is reprocessed partly at the La Hague UP2 plant and partly at the Marcoule pilot facility, undergoing transformation to reprocess all the fuel (TOR project, 5 t/y). The fuel from the Creys Malville prototype power plant will be reprocessed in a specific plant, which is in the design stage. The preliminary project, named MAR 600 (50 t/y), will mobilize a growing share of the CEA's R and D resources, as the engineering needs of the UP3 "light water" plant begins to decline. Nearly 20 tonnes of heavy metals irradiated in fast breeder reactors have been processed in France, 17 of which came from Phenix. The plutonium recovered during this reprocessing allowed the power plant cycle to be closed. This power plant now contains approximately 140 fuel asemblies made up with recycled plutonium, that is, more than 75% of the fuel assemblies in the Phenix core.

38841 (CONF-8505139—4) Studies of the hydrolytic and gamma-radiolytic degradation of the TRUEX-CCl_4 process solvent. Vandegrift, G. (Argonne National Lab., IL (USA)). May 1985. Contract W-31-109-ENG-38. 18p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85013885.

From 9. annual actinide separations workshop; Richland, WA, USA (22 May 1985).

The stability of the TRUEX-CCl_4 solvent (0.25M OphiD[iB]CMPO-0.75M TBP-CCl_4) toward hydrolytic and gamma-radiolytic degration is presently under study. The experimental procedure is discussed. Reported this quarter are the complete results for experiments run at 50°C to measure the nitric-acid-catalyzed degradation of the TRUEX-CCl_4 solvent and the partial results for hydrolytic degradation experiments run at 70°C and gamma-radiolytic degradation experiments run at 50°C. Discussions on (1) the predicted effect of temperature on the rate of solvent degradation based on TBP alone and (2) the effect on washing the degraded solvents with aqueous sodium carbonate solution are also presented. 9 refs., 5 tabs.

38842 (CONF-8506148—2) Mechanical accessories for mobile teleoperators. Feldman, M.J.; Herndon, J.N. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014310.

From Workshop on requirements of mobile teleoperators for radiological emergency response and recovery; Dallas, TX, USA (23 Jun 1985).

The choice of optimum mechanical accessories for mobile teleoperators involves matching the criteria for emergency response with the available technology. This paper presents a general background to teleoperations, a potpourri of the manipulator systems available, and an argument for force reflecting manipulation. The theme presented is that the accomplishment of humanlike endeavors in hostile environments will be most successful when man model capabilities are utilized. The application of recent electronic technology to manipulator development has made new tools available to be applied to emergency response activities. The development activities described are products of the Consolidated Fuel Reprocessing Program at the Oak Ridge National Laboratory. 13 refs., 7 figs.

38843 (Juel—1892) Separation of krypton from dissolver off-gas of a reprocessing plant using preparative gas chromatography. Matoni, M. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Chemische Technologie der Nuklearen Entsorgung; Technische Hochschule Aachen (Germany, F.R.)). Feb 1984. 118p. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE85752023.

Kr-85 can be separated from the pre-purified purge air in the final processing step of the purification phase for dissolver off-gases of a reprocessing plant with the aid of preparative gas chromatography. Activated carbon adsorbers in combination with helium as carrier gas permits maximum gas mixture through-flow. A separation temperature of 30°C is considered optimal. An adsorbent volume of 40 dm^3 is necessary for processing the residual gas flow of 2.5 Nm^3/h; the adsorbent is divided between 2 columns linked in series each of which are 2 m long with an internal diameter of 100 mm. The helium flow required is five times greater than the off-gas flow. The degree of purity for krypton is greater than 90% for a decontamination factor of greater than 1000.

38844 (Juel—1955) Mechanical separation process for decladding of LWR fuel elements. Koch, R. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Chemische Technologie der Nuklearen Entsorgung; Technische Hochschule Aachen (Germany, F.R.)). Oct 1984. 107p. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE85752013.

A comparison of the advantages and disadvantages of known methods of decladding led to cavitation erosion being used as a decladding mechanism. This process attacks not the jacket of the fuel rod but the fuel itself. Cavitation erosion is the consequence of imploding vapour bubbles entailing dynamic stress of a high frequency and high amplitude. The separation effect is due to the different material properties. Ductile materials as a rule are much more resistant to dynamic stress than brittle materials. Systematic experiments at varying pressures, volume flow, nozzle geometries and distances between nozzle and sample led to optimized parameters. There was a conspicuous rise in the relations pressure to depth of erosion and volume flow to depth of erosion. This considered, p=700 bar and d=1.6 mm were found to be useful parameters. The relation of the distance from nozzle to sample and the erosion obtained also has an optimum at s=50 mm. This distance can be shortened in the course of the operation. A great entrance angle combined with a nozzle outlet channel of the length l=1/2 D improves the erosion result considerably. The attack of the cavitating water jet on the jacket of the fuel rod causes a weight loss of <=2per mille.

0509 Transport And Storage

REFER ALSO TO CITATION(S) 38957, 38958, 38963

38845 (CONF-840307—52) US Department of Energy transportation programs: computerized techniques. Joy, D.S.; Johnson, P.E.; Fore, C.S.; Peterson, B.E. (Oak Ridge National Lab., TN (USA)). 1984. Contract AC05-84OR21400. 10p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015044.

From Waste management '84; Tucson, AZ, USA (11 Mar 1984).

The US Department of Energy is currently sponsoring the development of four specialized computer-based transportation programs at Oak Ridge National Laboratory. The programs function as research tools that provide unique computerized techniques for planning the safe shipment of radioactive and hazardous materials. Major achievements include the development of interactive rail and highway routing models, an emergency response assistance program, a data base focusing on legislative requirements, and a resource file identifying key state and local contacts. A discussion of the programs and data bases is presented, and several examples reflecting each project's applications to the overall DOE transportation program are provided. The interface of these programs offers a dynamic resource of data for use during preshipment planning stages. 10 refs., 4 figs., 2 tabs.

38846 (COVENIN—2026-83) Transport of radioactive materials and equipment. Requirements. (Provisional). (Consejo Nacional para el Desarrollo de la Industria Nuclear, Caracas (Venezuela)). 1983. 30p. (In Spanish). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701684.

This standard is aimed at establishing the procedures that must be followed when transporting radioactive materials and equipment in Venezuelan Territory. The "Consejo Nacional para el Desarrollo de la Industria Nuclear" is responsible for their fulfillment and control.

38847 (EPRI-EA—3619-Vol.4) Case studies in technology choice. Volume 4. Tennessee Valley Authority. Final report. Keeney, R.L.; Sicherman, A. (Woodward-Clyde Consultants, Walnut Creek, CA (USA)). Jul 1985. 64p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920752.

Since the mid-1970s, the Tennessee Valley Authority (TVA) has been considering different technological alternatives for managing their spent nuclear fuel. This report illustrates the use of the Technology Choice Model (TCM) to assist decision makers with this decision. A preliminary TCM application which addresses two spent fuel storage alternatives is presented and discussed. The report includes a procedure to elicit "values" from members of the public to evaluate alternatives. Use of the procedure was demonstrated through an illustrative example.

38848 (EPRI-NP—4119) Thermal testing of simulated BWR consolidated fuel. Final report. Eggers, P.E. (Ridihalgh, Eggers and Associates, Columbus, OH (USA)). Jul 1985. 64p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920746.

Dry storage of spent fuel depends on controlling excessive cladding temperatures that could damage containment barriers. In experimental studies using simulated BWR fuel, the atmosphere surrounding the fuel and the storage canister's position within an outer tube played key roles in keeping these temperatures at acceptable levels.

38849 **(HE-TP—27248) Analysis of transport logistics and routing requirements for radioactive waste management systems with respect to a minimum power scenario.** James, I.A. (Hunting Engineering Ltd., Bedford (UK)). Oct 1984. 91p. NTIS (US Sales Only), PC A05/MF A01. File Number DE85701881.

This report assesses the transport logistics associated with disposal of intermediate-level radioactive waste, as generated by CEGB, SSEB, UKAEA and BNFL, in accordance with a 'Minimum Power Scenario'. Transport by road and rail is analysed, as in previous reports; use of coastal shipping however has not been included but has been replaced with a combined road/rail option.

38850 **(HW—29635) Gas pressure in sealed sample cans concentrated plutonium nitrate.** Packer, G.V. (General Electric Co., Richland, WA (USA). Hanford Atomic Products Operation). 15 Oct 1953. Contract AC06-76RL01830. 7p. NTIS, PC A02. File Number TI85014697.

The objective of this work was to establish as fact that the predominant gas evolved from concentrated plutonium nitrate solutions is oxygen. Four sample cans containing plutonium nitrate at various concentrations were sealed using plug valves equipped with pressure gages. The results obtained showed that the gas evolved from concentrated plutonium nitrate solutions is predominately oxygen. It is believed that (1) the amount of gas evolved is dependent upon the amount of plutonium as plutonium (VI) and (2) the pressure build-up can be held to a minimum if the plutonium is all in the (IV) valence state when the sample can is sealed. Over the plutonium concentration range anticipated for normal operation the solution concentration does not appear to affect the rate of gas evolution or the total pressure. 2 figs., 1 tab.

38851 **(INIS-mf—9308) Interim storage of solidified fission products from fuel element reprocessing with utilization of obtaining post-decay heat.** Kelm, W. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Maschinenwesen). 24 Oct 1983. 172p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE85781408.

It is noted that the out-lined interim store for HRW with industrial utilization of decay heat (production of saturated steam and hydrogen) does include a certain risk potential like any technical plant but that it does not represent a danger to the population living nearby. All internal and external impacts on the store result in safely triggering natural convection cooling. A further emergency cooling system is provided by the water irrigation facility so that obtaining after-heat can be safely removed under all circumstances. Therefore, there are no safety-technology arguments against any realization of the concept presented for interim storage of solidified high-level radio-active wastes. An interim store of this type may be built and operated even in densely populated regions and urban agglomerations.

38852 (INIS-mf—9573-Vol.2, pp 274-309) **Transport of radioactive material.** Parra Iniguez, A. (Comision Nacional de Seguridad Nuclear y Salvaguardias, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781409.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Described are standards established in IAEA regulations for safe transport of radioactive material.

38853 **(INIS-mf—9657) Ministerial Order of 31 December 1982 made in implementation of the Royal Order of 5 November 1982 on the training certificate for drivers of vehicles carrying radioactive materials in cisterns or vessels.** (International Atomic Energy Agency, Vienna (Austria)). 27 Jan 1983. 1p. (In French and Dutch). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781410.

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Published in the Moniteur Belge.

This Ministerial Order fixes the conditions for obtaining the ADR training certificate for driving transport vehicles which contain radioactive materials in cisterns and vessels. It is the first in a series of four Orders made under the 1982 Royal Order.

38854 **(INIS-mf—9658) Ministerial Order of 31 December 1982 made in implementation of Section 3(2)(a) of the Royal Order of 5 November 1982 on the training certificate for drivers of vehicles carrying radioactive materials in cisterns or vessels.** (International Atomic Energy Agency, Vienna (Austria)). 27 Jan 1983. 8p. (In French and Dutch). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781411.

Published in the Moniteur Belge.

This Ministerial Order fixes the conditions for obtaining the ADR training certificate for driving transport vehicles which contain radioactive materials in cisterns and vessels. It is the second of four Orders made under the 1982 Royal Order.

38855 **(INIS-mf—9659) Ministerial Order of 31 December 1982 made in implementation of Section 8(1) of the Royal Order of 5 November 1982 on the training certificate for drivers of vehicles carrying radioactive materials in cisterns or vessels.** (International Atomic Energy Agency, Vienna (Austria)). 27 Jan 1983. 2p. (In French and Dutch). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781412.

Published in the Moniteur Belge.

This Ministerial Order fixes the conditions for obtaining the ADR training certificate for driving transport vehicles which contain radioactive materials in cisterns and vessels. It is the third of four Orders made under the 1982 Royal Order.

38856 **(INIS-mf—9660) Ministerial Order of 31 December 1982 made in implementation of Section 9 of the Royal Order of 5 November 1982 on the training certificate for drivers of vehicles carrying radioactive materials in cisterns or vessels.** (International Atomic Energy Agency, Vienna (Austria)). 27 Jan 1983. 1p. (In French and Dutch). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781413.

Published in the Moniteur Belge.

This Ministerial Order fixes the conditions for obtaining the ADR training certificate for driving transport vehicles which contain radioactive materials in cisterns and vessels. This is the fourth in the series of Orders made under the 1982 Royal Order.

38857 **(PNL—4189-Rev.1) Behavior of spent nuclear fuel and storage system components in dry interim storage. Revision 1.** Johnson, A.B. Jr.; Gilbert, E.R.; Guenther, R.J. (Pacific Northwest Labs., Richland, WA (USA)). Feb 1983. Contract AC06-76RL01830. 171p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE85015320.

Irradiated nuclear fuel has been handled under dry conditions since the early days of nuclear reactor operation, and use of dry storage facilities for extended management of irradiated fuel began in 1964. Irradiated fuel is currently being stored dry in four types of facilities: dry wells, vaults, silos, and metal casks. Essentially all types of irradiated nuclear fuel are currently stored under dry conditions. Gas-cooled reactor (GCR) and liquid metal fast breeder reactor (LMFBR) fuels are stored in vaults and dry wells. Certain types of fuel are being stored in licensed dry storage facilities: Magnox fuel in vaults in the United Kingdom; organic-cooled reactor (OCR) fuel (clad with a zirconium alloy) in silos in Canada; and boiling water reactor (BWR) fuel (clad with Zircaloy) in a metal storage cask in Germany. Dry storage demonstrations are under way for Zircaloy-clad fuel from BWRs, pressurized heavy-water reactors (PHWRs), and pressurized water reactors (PWRs) in all four types of dry storage facilities. The demonstrations and related hot cell and laboratory tests are directed toward expanding the data base and establishing a licensing basis for dry storage of water reactor fuel. This report reviews the scope of dry interim storage technology, the performance of fuel and facility materials, the status of programs in several countries to license dry storage of water reac-

tor fuel, and the characteristics of water reactor fuel that relate to dry storage conditions. 110 refs., 22 figs., 28 tabs.

38858 (PNL—5109-Rev.1) Characterization of LWR spent fuel MCC-approved testing material - ATM-101. Revision 1. Barner, J.O. (Pacific Northwest Labs., Richland, WA (USA)). Jun 1985. Contract AC06-76RL01830. 225p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE85015807.

The characterization data, obtained to date, for Materials Characterization Center (MCC) Approved Testing Material (ATM)-101, spent fuel from H.B. Robinson, Unit 2, Assembly B0-5, are described. ATM-101 consists of 27 equal-length segments from nine fuel rods. Characterizations provided for ATM-101 include: (1) reactor, assembly, and fuel rod descriptions; (2) Assembly BO-5 irradiation history; (3) a description of unusual incidents that occurred to the rods; (4) fission gas release measurements; (5) results of ceramography/metallography examinations; (6) fuel burnup measurement results and correlations; (7) results of gamma scanning; (8) calculated values of the radionuclide inventory; and (9) results of a radionuclide chemical overcheck. Calculations for and measurement of radial distributions of selected radionuclides are planned, but not scheduled. A description of pertinent results from other studies on sibling rods from Assembly B0-5 is also included. The distribution of ATM-101 to date is described along with characterization results on specially processed material. It is intended that this report be revised and updated as additional characterization data become available. 6 refs., 30 figs., 20 tabs.

38859 (SAND—85-7153) History of nuclear materials transportation and packaging research and development sponsored by the US federal government. Final report. Pellettieri, M.W.; Welles, B.W. (International Energy Associates Ltd., Washington, DC (USA)). Jul 1985. Contract AC04-76DP00789. 42p. (IEAL—336). NTIS, PC A03/MF A01; GPO Dep. File Number DE85015606.

Regulation of radioactive materials transported in the United States began 47 years ago. Numerous federal agencies have supported technical programs to improve the safety of nuclear transport. This report outlines the transportation technology research and development programs and transport and packaging regulations that were developed by: US Postal Service; Interstate Commerce Commission; Atomic Energy Commission; International Atomic Energy Agency; Department of Transportation; Nuclear Regulatory Commission and Energy Research and Development Administration; and finally, Department of Energy (DOE). In 1978, DOE, through the Albuquerque Operations Office, established the Transportation Technology Center (TTC) with Sandia National Laboratories (SNL) as lead contractor. DOE's research and development program objectives are discussed, and the resources of SNL and supporting laboratories to the TTC are described. 36 refs., 2 figs., 2 tabs.

38860 (UNI-SA—150) Criticality control in large tanks. Tollefson, D.A.; Toffer, H.; Benjamin, J.A. (UNC Nuclear Industries, Inc., Richland, WA (USA)). 1985. Contract AC06-76RL01857. 13p. (CONF-850917—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012037.

From Topical meeting on criticality safety and the storage of fissile material; Jackson, WY, USA (9 Sep 1985).

Spent fuel storage and handling operations at the Hanford N Reactor utilize sizable tanks and storage basins for fissile isotope bearing liquids and irradiated fuel elements. Criticality control measures are fairly straightforward for homogeneous solutions and regular arrays. However, if inhomogeneities can occur, criticality control becomes a much more complex process. Criticality control methods are described for both normal and accident conditions for spent fuel storage. In addition, a method of analysis is presented that provides an estimate of neutron detector response for different fissile material configurations. This method can be adapted to other configurations where physical constraints alone cannot prevent a significant accumulation of fissile materials and administrative controls must be relied upon for the prevention of a criticality accident. 5 refs., 5 figs.

0510 Marketing And Economics

REFER ALSO TO CITATION(S) 38942

38861 (CRS-WP—27) Prospects for Canadian uranium. Salaff, S. (Queen's Univ., Kingston, Ontario (Canada). Centre for Resource Studies). Jul 1983. 50p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701681.

The 1980s have seen a decline in markets for uranium concentrate, largely as a result of falling estimates for reactor fuel requirements and rising inventories. Spot market prices fell to $44 in September 1982, but have since risen back to $60. World production also fell in 1982 and is not expected to increase significantly before 1990. Some opportunities exist for Canadian producers with new low-cost deposits to replace high-cost producers in Canada and other countries, particularly the United States. There will be strong competition between Canadian producers as well as from Australia. Australia's reserves are somewhat larger than Canada's, although the reported ore grades tend to be lower than those of Saskatchewan.

38862 (DOE/AL/27864—T2) International market survey to assess the procurement of (1) depleted uranium to the dimensions similar to the uranium liner for the DHLW Cask. (Engineering Analysis and Test Co., Santa Monica, CA (USA)). 29 May 1985. Contract AC04-84AL27864. 53p. NTIS MF A01; 2; GPO Dep. File Number DE85012404.

This document presents the results of an international market survey to assess the procurement of depleted uranium to the dimensions similar to the uranium liner for the DHLW Cask.

38863 (INIS-mf—9517) Political and legal problems of international nuclear supply agreements: the Euratom experience. Allen, D.W. (International Nuclear Law Association (INLA), Brussels (Belgium)). 1983. 13p. (CONF-8309278—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781355.

From Nuclear inter jura '83; San Francisco, CA, USA (11 Sep 1983).

This paper analyses the Chapters in the Euratom Treaty which are relevant to uranium supply agreements and the European Community's powers in international relations as conferred by the Treaty. It also examines the agreements concluded by Euratom with the US, Canada and Australia respectively with emphasis on their nuclear non-proliferation aspects.

0520 Waste Management

REFER ALSO TO CITATION(S) 38838, 38937, 38938, 38939, 38940, 38941, 38950, 38951, 39154, 39370, 39679, 40173, 40349, 40350, 40381, 40392, 40396, 40887

38864 (AAEC/E—499) Demonstration of an initial screening phase for site selection for low level radioactive waste burial - an evaluation of relevant IAEA guidelines. (Australian Atomic Energy Commission Research Establishment, Lucas Heights). Apr 1984. 101p. NTIS (US Sales Only), PC A06/MF A01. File Number DE85781086.

Low level radioactive wastes, arising from the use of radioisotopes in medicine and industry are accumulating throughout Australia. The rate of accumulation has not been large and storage of these wastes close to the point of use has proved practicable to date, but consideration must now be given to a central repository or repositories for these low level wastes. This report considers the question of selecting a site suitable for disposal of wastes by shallow ground burial. It attempts to asses the practicability of using factors suggested by the IAEA for the initial phase of site screening. The screening process described has essentially two stages. In the first, New South Wales was divided into broad structural units and these ranked in order of suitability. In the second stage, survey sites in which thick clay beds outcropped were delineated in the five highest ranking structural units. These survey sites were ranked on the basis of various geomorphological properties which largely described the hydrogeology of the site.

38865 **(AECL—6820) Nuclear fuel waste disposal. Long-term stability analysis.** Merrett, G.J.; Gillespie, P.A. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Jul 1983. 49p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85900470.

This report discusses events and processes that could adversely affect the long-term stability of a nuclear fuel waste disposal vault or the regions of the geosphere and the biosphere to which radionuclides might migrate from such a vault.

38866 **(AECL—8378) Proposed risk acceptance criterion for nuclear fuel waste disposal.** Mehta, K. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Jun 1985. 17p. Scientific Document Distribution Office, Atomic Energy of Canada Limited, Chalk River, Ontario, Canada $2.00. File Number TI85901865.

Work performed under Canada/US Waste Management Information Exchange Agreement.

The need to establish a radiological protection criterion that applies specifically to disposal of high level nuclear fuel wastes arises from the difficulty of applying the present ICRP recommendations. These recommendations apply to situations in which radiological detriment can be actively controlled, while a permanent waste disposal facility is meant to operate without the need for corrective actions. Also, the risks associated with waste disposal depend on events and processes that have various probabilities of occurrence. In these circumstances, it is not suitable to apply standards that are based on a single dose limit as in the present ICRP recommendations, because it will generally be possible to envisage events, perhaps rare, that would lead to doses above any selected limit. To overcome these difficulties, it is proposed to base a criterion for acceptability on a set of dose values and corresponding limiting values of probabilities; this set of values constitutes a risk-limit line. A risk-limit line suitable for waste disposal is proposed that has characteristics consistent with the basic philosophy of the ICRP and UNSCEAR recommendations, and is based on levels of natural background radiation. 13 refs., 2 figs.

38867 **(AERE-G—3159) Preliminary findings of the effect of surface finish and coatings on PuO_2 contamination hold-up and ease of decontamination in aqueous and non-aqueous media.** Dalton, J.T.; Chamberlain, H.E.; Turner, A.D.; Dawson, R.K. (UKAEA Atomic Energy Research Establishment, Harwell. Chemistry Div.). Nov 1984. 25p. (DDTF—52; PCMRP—84-P14). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701876.

The application of temporary and permanent coatings for the reduction of α-activity hold-up and increased ease of decontamination has been reviewed and a variety of surface treatments and coatings identified as being worthy of investigation. A range of specimens have been prepared with hard coatings and smooth surfaces. A number of adhesive films, paints and lacquers have been applied to mild and stainless steel substrates. In order to compare the different surfaces, a standard contamination technique using a mechanical wiper has been developed to reproducibly contaminate the materials with PuO_2. A standard decontamination test using water/Decon 75 or Arklone X is being used to compare the ease of decontamination. Preliminary experiments have shown that the smoothest surface finishes have the lowest activity hold-up and are more easily cleaned. Due to the superior level of micro-smoothness attainable on metals, these showed a significantly lower activity retention than the organic coatings examined to date. A comparison of the relative efficiency of cleaning in Decon 75 and Arklone X showed that generally speaking metal surfaces were cleaned equally well by both media, while the unaged organic surfaces were decontaminated more thoroughly in Arklone X, though the differences were somewhat marginal.

38868 **(AERE-R—11390) Equilibrium leach testing of Magnox fuel cladding residues.** Greenfield, B.F.; Greenham, P.; Pellet, C.R.; Rees, J.H.; Streeton, R.J.W.; Thompson, R. (UKAEA Atomic Energy Research Establishment, Harwell. Chemical Technology Div.). Oct 1984. 26p. HMSO, London, price Pound 4.00.

Equilibrium (or static) leach tests have been carried out on Magnox swarf and silo sludge with cement as the matrix for immobilisation. This kind of test gives indications of the upper levels of radionuclides that might eventually be reached in repository waters. Cement was found to be effective in restricting equilibrium concentrations of the actinides. Solution levels in these experiments were mainly in the pico- to nanomolar region. There was good agreement between the experimental results and calculated values based on the solubilities and sorption coefficients of individual actinides given in the accompanying paper.

38869 **(AERE-R—11411) Assessment of filter aids and filter cloths in the dewatering of intermediate level wastes.** Knibbs, R.H.; Hudson, B.C.; Blackwell, J.C.W. (UKAEA Atomic Energy Research Establishment, Harwell. Chemical Technology Div.). Dec 1984. 23p. (ILWRP—84-P2). HMSO, London, price Pound 4.00.

This report considers a range of filter cloths and precoat materials intended for use in dewatering intermediate level radioactive wastes, and their interaction when used on a rotary drum vacuum filter. The report outlines the advantages and disadvantages of various grades and types of precoat and shows that grades with permeabilities in the intermediate range, 3 to 4 x 10^{-12} m^2, give satisfactory filtrate quality together with ease of operation. The work on filter cloths shows that: radiation damage is not a limiting factor as regards operational life for any of the cloths examined; polyester-based cloths are unsuitable due to their poor resistance to alkali attack; polyamide cloths are satisfactory; and stainless steel Dutch weave cloths are satisfactory and have the added advantage of high strength. The report also briefly considers the radiation resistance of two elastomeric membranes used on the epidermal filter and shows that the natural latex rubber membrane is considerably more resistant to radiation than the silicone rubber membrane and has an estimated operational life of at least 1200 hours when dewatering Magnox silo sludge or α-contaminated alumino ferric flocs.

38870 **(AERE-TP—1058) Analytical solutions to the three-dimensional radionuclide transport equation for computer code verification.** Herbert, A.W. (UKAEA Atomic Energy Research Establishment, Harwell. Theoretical Physics Div.). Nov 1984. 32p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781312.

A series of analytical solutions to the three-dimensional radionuclide transport equation are derived and used to verify the numerical accuracy of the finite-element code NAMSOL. Good agreement is found for grid Peclet numbers up to eight. Above this value the solution becomes unstable as expected from the standard stability criterion.

38871 **(AERE-TP—1072) Connectivity, flow and transport in network models of fractured media.** Robinson, P.C. (UKAEA Atomic Energy Research Establishment, Harwell. Theoretical Physics Div.; Oxford Univ. (UK). St. Catherine's Coll.). Oct 1984. 150p. NTIS (US Sales Only), PC A07/MF A01. File Number DE85781313.

Thesis (Ph.D.).

In order to evaluate the safety of radioactive waste disposal underground it is important to understand the way in which radioactive material is transported through the rock to the surface. If the rock is fractured the usual models may not be applicable. In this work we look at three aspects of fracture networks: connectivity, flow and transport. These are studied numerically by generating fracture networks in a computer and modelling the processes which occur. Connectivity relates to percolation theory, and critical densities for fracture systems are found in two and three dimensions. The permeability of two-dimensional networks is studied. The way that permeability depends on fracture density, network size and spread of fracture length can be predicted using a cut lattice model. Transport through the fracture network by convection through the fractures and mixing at the intersections is studied. The Fickian dispersion equation does not describe the resulting hydrodynamic dispersion. Extensions to the techniques to three dimensions and to include other processes are discussed.

38872 **(BNL-NUREG—36715) Leaching studies of low-level radioactive waste forms.** Dayal, R.; Arora, H.; Milian, L.; Clinton, J. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 6p. (CONF-850609—1). NTIS, PC A02/MF A01 - GPO. File Number TI85015184.

From 25. annual international conference of the Canadian Nuclear Association and 6. annual conference of the Canadian Nuclear Society; Ottawa, Ontario, Canada (2 Jun 1985).

A research program has been underway at the Brookhaven National Laboratory to investigate the release of radionuclides from low-level waste forms under laboratory conditions. This paper describes the leaching behavior of Cs-137 from two major low-level waste streams, that is, ion exchange bead resin and boric acid concentrate, solidified in Portland cement. The resultant leach data are employed to evaluate and predict the release behavior of Cs-137 from low-level waste forms under field burial conditions.

38873 **(CONF-850960—2) Waste disposal by hydrofracture and application of the technology to the management of hazardous wastes.** Stow, S.H.; Haase, C.S.; Weeren, H.O. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85013990.

From International conference on new frontiers for hazardous waste management; Pittsburgh, PA, USA (15 Sep 1985).

Environmental Sciences Division Publication No. 2532.

A unique disposal method, involving hydrofracturing, has been used for management of liquid low-level radioactive wastes at Oak Ridge National Laboratory (ORNL). Wastes are mixed with cement and other solids and injected along bedding plane fractures into highly impermeable shale at a depth of 300 m forming a grout sheet. The process has operated successfully for 20 years and may be applicable to disposal of hazardous wastes. The cement grout represents the primary barrier for immobilization of the wastes; the hydrologically isolated injection horizon represents a secondary barrier. At ORNL work has been conducted to characterize the geology of the disposal site and to determine its relationship to the injection process. The site is structurally quite complex. Research has also been conducted on the development of methods for monitoring the extent and orientation of the grout sheets; these methods include gamma-ray logging of cased observation wells, leveling surveys of benchmarks, tiltmeter surveys, and microseismic arrays. These methods, some of which need further development, offer promise for real-time and post-injection monitoring. Initial suggestions are offered for possible application of the technology to hazardous waste management and technical and regulatory areas needing attention are addressed. 11 refs., 1 fig.

38874 **(CONF-8509119—1) Retrieval effects on ventilation and cooling requirements for a nuclear waste repository.** Hambley, D.F. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85013889.

From 2. Society of Mining Engineers U.S. mine ventilation symposium; Reno, NV, USA (23 Sep 1985).

The Nuclear Waste Policy Act of 1982 (Public Law 97-425) and the regulations promulgated in Title 10, Part 60 of the Code of Federal Regulations (10CFR60) by the US Nuclear Regulatory Commission (NRC) for an underground repository for spent fuel and high level nuclear waste (HLW) require that it is possible to retrieve waste, for whatever reason, from such a facility for a period of 50 years from initial storage or until the completion of the performance confirmation period, whichever comes first. This paper considers the effects that the retrievability option mandates on ventilation and cooling systems required for normal repository operations. An example is given for a hypothetical repository in salt. 18 refs., 1 tab.

38875 **(DOE/AL/18797—T2) Plan for implementing EPA standards for UMTRA sites.** (Geochemistry and Environmental Chemistry Research, Inc., Rapid City, SD (USA)). Jan 1984. Contract AC04-82AL18797. 31p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85014386.

Report DOE/AL-163-UMTRA.

This plan is designed to be a generic presentation on methodology that will be followed in implementing the EPA standards. Its applicability covers 24 inactive uranium mill tailings sites and approximately 8000 vicinity properties, no two of which are alike. This diversity dictates the more general approach of this plan. In practice, however, site-specific application will be implemented and will require extensive consultation with the appropriate state or tribe and the NRC. In addition, information concerning relevant Federal, state, or tribal standards and regulations will be considered along with any data that may assist in the evaluations. Throughout this process, DOE will encourage state and tribal participation to ensure that compliance with the EPA standards will be achieved.

38876 **(DOE/CH—2) Response to state comments on the draft regional characterization reports for the Crystalline Repository Project.** (Battelle Memorial Inst., Argonne, IL (USA). Office of Crystalline Repository Development). Nov 1984. Contract AC02-83CH10139. 222p. NTIS, PC A10/MF A01; GPO Dep. File Number DE85015554.

In May, 1983, the US Department of Energy (DOE) Crystalline Repository Project Office (CPO) issued six draft Regional Characterization Reports (RCRs) for review and comment to the 17 Crystalline States comprising the Northeastern, Southeastern, and North Central crystalline regions. Comment letters were received from 13 of the 17 states. The more than 2000 comments generally focused on the quality and content of the characterization reports and on their intended use in region-to-area screening. These comments were paraphrased and grouped into 23 subjects within the following four topical areas: (1) General and Programmatic; (2) Geologic; (3) Environmental and Socioeconomic; and (4) Editorial. This document provides responses to the comments submitted by the states.

38877 **(DOE/NE/44153—T1) Preliminary evaluation of criteria for the disposal of transuranic contaminated waste.** (National Council on Radiation Protection and Measurements, Bethesda, MD (USA)). 5 Feb 1982. Contract FG01-81NE44153. 22p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015089.

The National Council on Radiation Protection and Measurements (NCRP), as part of its program of addressing all scientific issues relating to radiation protection, in 1971 set up a scientific committee (SC-38) on waste disposal chaired by Merril Eisenbud. Several reports developed by Task Groups of this Committee have already been published by the NCRP and others are in progress. When discussion with officials in the US Department of Energy (DOE) indicated that there was a pressing need to address the criteria associated with the disposal of transuranic waste and especially the concentration levels at which different modes of burial might be indicated, the NCRP set up, in October 1981, a Task Group on Criteria for the Disposal of Transuranic (TRU) Contaminated Waste (operating under the aegis of Scientific Committee 38) to take a preliminary look at the problem. This Task Group has produced this report containing its preliminary analysis of the situation with respect to the disposal of transuranic waste. Because of the potential and immediate value to the nation of this preliminary report at this time, the Board of Directors of the NCRP decided to issue the reports on its own authority. An important recommendation of this report is that although the concentration limits used by the DOE may be conservative under many conditions, a thorough study needs to be made of the options available at specific storage sites in order to conform to predetermined dose limits rather than generic concentration limits. Because of this recommendation and the preliminary character of this report, it is expected that a more detailed report on the subject will be subsequently developed for consideration by the full Council. 35 refs., 2 tabs.

38878 **(DOE/NV/10327—13) In situ gaseous tracer diffusion experiments and predictive modeling at the Greater Confinement Disposal Test.** Olson, M.C. (Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (USA)). Jul 1985. Contract AC08-84NV10327. 129p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE85015608.

The Greater Confinement Disposal Test (GCDT) at the Nevada Test Site is a research project investigating the feasibility of augered shaft disposal of low-level radioactive waste considered unsuitable for shallow land burial. The GCDT contains environ-

mentally mobile and high-specific-activity sources. Research is focused on providing a set of analytically derived hydrogeologic parameters and an empirical database for application in a multiphase, two-dimensional, transient, predictive performance model. Potential contaminant transport processes at the GCDT are identified and their level of significance is detailed. Nonisothermal gaseous diffusion through alluvial sediments is considered the primary waste migration process. Volatile organic tracers are released in the subsurface and their migration is monitored in situ to determine media effective diffusion coefficients, tortuosity, and sorption-corrected porosity terms. The theoretical basis for volatile tracer experiments is presented. Treatment of thermal and liquid flow components is discussed, as is the basis for eliminating several negligible transport processes. Interpretive techniques include correlation, power spectra, and least squares analysis, a graphical analytical solution, and inverse numerical modeling. Model design and application to the GCDT are discussed. GCDT structural, analytical, and computer facilities are detailed. The status of the current research program is reviewed, and temperature and soil moisture profiles are presented along with results of operational tests on the analytical system. 72 refs., 39 figs., 2 tabs.

38879 (DOE/SR-WM—85-1) Savannah River Interim Waste Management Program Plan, FY 1985. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant). Jun 1985. Contract AC09-76SR00001. 163p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE85014959.

This document provides the program plan as requested by the Savannah River Operations Office of the Department of Energy. The plan was developed to provide a working knowledge of the nature and extent of the interim waste management programs being undertaken by Savannah River (SR) contractors for the Fiscal Year 1985. In addition, the document projects activities for several years beyond 1985 to adequately plan for safe handling and storage of radioactive wastes generated at Savannah River and for developing technology for improved management of low-level solid wastes. A revised plan will be issued prior to the beginning of the first quarter of each fiscal year. In this document, work descriptions and milestone schedules are current as of the date of publication. Budgets are based on available information as of October 1984.

38880 (EGG-M—06885) DOE approach to threshold quantities. Wickham, L.E.; Kluk, A.F. (EG and G Idaho, Inc., Idaho Falls (USA); USDOE, Washington, DC). 1985. Contract AC07-76ID01570. 5p. (CONF-850314—72). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014627.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Department of Energy (DOE) is developing the concept of threshold quantities for use in determining which waste materials must be handled as radioactive waste and which may be disposed of as nonradioactive waste at its sites. Wastes above this concentration level would be managed as radioactive or mixed waste (if hazardous chemicals are present); waste below this level would be handled as sanitary waste. Ideally, the threshold must be set high enough to significantly reduce the amount of waste requiring special handling. It must also be low enough so that waste at the threshold quantity poses a very small health risk and multiple exposures to such waste still constitute a small health risk. It should also be practical waste above or below the threshold using available instrumentation. Guidance is being prepared to aid DOE sites in establishing threshold quantity values based on pathways analysis using site-specific parameters (waste stream characteristics, maximum exposed individual, population considerations, and site specific parameters such as rainfall, etc.). A guidance dose of between 0.001 to 1.0 mSv/yr (0.1 to 100 mrem/yr) was recommended with 0.3 mSv/yr (30 mrem/yr) selected as the guidance dose upon which to base calculations. Several tasks were identified, beginning with the selection of a suitable pathway model for relating dose to the concentration of radioactivity in the waste. Threshold concentrations corresponding to the guidance dose were determined for waste disposal sites at a selected humid and arid site. Finally, cost-benefit considerations at the example sites were addressed. The results of the various tasks are summarized and the relationship of this effort with related development at other agencies discussed. 13 refs., 1 fig., 1 tab.

38881 (EGG-M—21484) Options for treatment, storage, and/or disposal of radioactive mixed waste at the Idaho National Engineering Laboratory. Nishimoto, D.D.; Falconer, K.L.; Wiggins, D.J. (EG and G Idaho, Inc., Idaho Falls (USA)). 1985. Contract AC07-76ID01570. 6p. (CONF-850314—71). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014619.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

A study is being performed at the Department of Energy's Idaho National Engineering Laboratory (INEL) to determine the most feasible options for the management of INEL radioactive mixed waste and to develop a program plan for implementing the selected options. Radioactive mixed waste generated at the INEL by Department of Energy (DOE) facilities must be managed in accordance with DOE Order 5480.2 and the Memorandum of Understanding between the Environmental Protection Agency Administrator and the Secretary of Energy. These requirements specify that facilities which generate, treat, store, and/or dispose radioactive mixed waste comply with regulations issued under the Resource Conservation and Recovery Act for hazardous waste. Currently, there are no acceptable INEL facilities for the treatment, storage, and/or disposal of radioactive mixed waste. This paper will discuss the type and volume of radioactive mixed waste generated at the INEL; selection criteria used to determine the most viable option (i.e., technical, economic, and regulatory constraints); and available options for treatment, storage, and/or disposal. 2 refs., 1 tab.

38882 (EUR—8748) Proceedings of a technical session on rock mechanics "Advance in laboratory sample testing". Come, B. (ed.). (Commission of the European Communities, Luxembourg). 1984. 331p. (CONF-8304224—). NTIS (US Sales Only), PC A15/MF A01. File Number DE85701670.

From C.E.C. technical session on rock mechanics: advance in laboratory sample testing; Brussels, Belgium (27 Apr 1983).

This report brings together a series of papers about rock mechanics. The meeting was divided into three sessions, which dealt with the three main types of rock formation currently considered in the CEC Programme: granite, clay and salt. Safe disposal of high-level radioactive waste involves the proper design of deep underground repositories. This necessitates an in-depth knowledge of the mechanical properties of the rock mass. The behaviour of the rock mass must be known both for the construction and the operation (heating effects) of the repository. Usually, the dominant factor for designing an underground structure is the fracturing of the rock mass. In the present case, the rock is chosen with a very low fracturing. Therefore, the mechanical properties of the formation are mainly those of the rock matrix. These properties are obtained, at least in a first exploratory step, by laboratory testing of rock samples obtained by core-drilling from surface. This aspect of rock characterization was thought to deserve a special technical meeting, in order to bring together most of the results obtained in this field by contracting partners of the CEC for the years 1980-82.

38883 (EUR—8749) Carbon-14 waste management. Bush, R.P.; Smith, G.M.; White, I.F. (Commission of the European Communities, Luxembourg). 1984. 136p. NTIS (US Sales Only), PC A07/MF A01. File Number DE85701671.

Carbon-14 occurs in nature, but is also formed in nuclear reactors. Because of its long half-life and the biological significance of carbon, releases from nuclear facilities could have a significant radiological impact. Waste management strategies for carbon-14 are therefore of current concern. Carbon-14 is present in a variety of waste streams both at reactors and at reprocessing plants. A reliable picture of the production and release of carbon-14 from various reactor systems has been built up for the purposes of this study. A possible management strategy for carbon-14 might be the reduction of nitrogen impurity levels in core materials, since the activation of ^{14}N is usually the dominant source of carbon-14. The key problem in carbon-14 management is its retention of off-gas streams, particularly in the dissolver off-gas stream at reprocessing plants. Three alternative trapping processes that convert carbon dioxide into insoluble carbonates have been suggested. The results show that none of the options considered need be rejected on the grounds of potential radiation doses to individuals. All exposures should be as low as reasonably achievable, economic and social factors being taken into

account. If, on these grounds, retention and disposal of carbon-14 is found to be beneficial, then, subject to the limitations noted, appropriate retention, immobilization and disposal technologies have been identified.

38884 **(EUR—8796) Trial storage of high-level waste in the Asse II salt mine. Final report 1980.** (Commission of the European Communities, Luxembourg). 1984. 293p. NTIS (US Sales Only), PC A13/MF A01. File Number DE85701672.

This report covers a second phase of the work performed by GSF and KfK in the Asse II salt mine, with a view to disposal of radioactive waste in salt formations. New items of the research were geophysical investigations of the behaviour of heated salt and preparation of a trial storage in the Asse II salt mine.

38885 **(EUR—8797) Trial storage of high-level waste cylinders in the Asse II salt mine. Final report 1977/1978.** (Commission of the European Communities, Luxembourg). 1984. 197p. NTIS (US Sales Only), PC A09/MF A01. File Number DE85701673.

This report covers the contract period 1976-77, as well as some of the tasks carried out during the extension in 1978, in the framework of the R and D programme for disposal of radioactive waste in salt formations. With regard to the in-situ tests for the liberation and migration of brine, the testing devices were examined successfully. Laboratory examinations carried out showed a stepwise liberation of the water contents in halite in dependence on the temperature. The amount of brine liberated stood in good agreement with the in situ results. A temperature test for borehole convergence resulted in definite convergence rates. Simultaneously no influence was registered in the stability of the surrounding rocks. For the realization of an integrated major experiment, temperature test field IV was mined on the 750 m level of the Asse Salt Mine and heater- as well as measurement drillings were carried out. Extensive rheological examinations are concentrated particularly on the halite and secondly on the Carnallite. They are chiefly based on uni- and multiaxial pressure tests. Computer programmes are developed to examine the heat generation in wastes as well as in salt. In comparison, the programme development of computer codes for the stability behaviour of rocks is still at a relatively early stage, because it has to build up on the results of heat generation. The works for the development of a transport container with a shielding combination are at a very advanced stage. An integrated disposal- and retrieval system was developed, tested and successfully demonstrated. A monitoring system in the mine has also been developed in its essential parts.

38886 **(EUR—9115-Vol.1) Backfilling and sealing of radioactive waste repositories. Vol. 1. Text - Reference - List of symbols.** (Commission of the European Communities, Luxembourg). 1984. 280p. NTIS (US Sales Only), PC A13/MF A01. File Number DE85701674.

The report is in two volumes: Volume 1 contains the main text, the references and a list of symbols, and Volume 2, all the figues, tables and appendices. In Volume 1, backfilling and sealing is considered in relation to the geological, physical and chemical environments. There follows a detailed evaluation of the role and performance of the backfilling and sealing system in terms of thermal, hydraulic, chemical buffering, radionuclide retention, mechanical properties and behaviour as well as longevity. The results of the listing, screening and classification of a comprehensive range of candidate backfill materials are summarized. The different candidate materials are examined.

38887 **(EUR—9115-Vol.2) Backfilling and sealing of radioactive waste repositories. Vol. 2. Figure - Tables - Appendices.** (Commission of the European Communities, Luxembourg). 1984. 216p. NTIS (US Sales Only), PC A10/MF A01. File Number DE85701675.

The two volumes of this report present a review study about backfilling and sealing of radioactive waste repositories in granites, argillaceous and salt formations. Volume 2 contains all the figures, table and appendices. A detailed account of candidate backfill materials is given in a standardized format.

38888 **(EUR—9258) Cataclastic effects in rock salt laboratory and in situ measurements.** Gramberg, J.; Roest, J.P.A. (Commission of the European Communities, Luxembourg). 1984. 73p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701676.

The aim of the research is the determination of eventual cataclastic effects in environmental rock salt of a heated part of a vertical deep test bore hole, a model for HLW disposal. Known cataclastic systems from hard rock mining and rock salt mines will form the starting point for the explanation of convergence of underground cavity walls. In rock salt, however, different elements seem to prevail: crystal plasticity and micro-cataclasis. The environmental measurements at the deep bore hole have to be carried out from a distance. To this end the acoustic micro-seismic method will be a suitable one. The appropriate equipment for micro-seismic cross hole measurement is designed, constructed and tested in the laboratory as well as underground. Acoustic velocity data form a crucial point. A micro-seismic acoustic P-wave model, adapted to the process of structural changes, is developed. P-wave velocity measurements in rock salt cubes in the laboratory are described. An underground cross hole measurement in the wall of a gallery with semi-circular section is treated and analysed. A conclusion was that, in this case, no macro-cataclasis (systematic large fractures) will be involved in the process of gallery convergence, but that the mechanism proved to be a combination of crystal plasticity and micro-cataclasis. The same mechanism might be expected to be present in the environmental rock salt of the HLW-disposal deep bore hole. As a result this environmental rock salt might be expected to be impermeable. A plan for the application of the developed equipment during the heating test on the ECN-deep-bore-hole is shown. A theory on "disking" or "rim cracks" is presented in an annex.

38889 **(EUR—9306) LISA. A code for safety assessment in nuclear waste disposals program description and user guide.** Saltelli, A.; Bertozzi, G.; Stanners, D.A. (Commission of the European Communities, Luxembourg). 1984. 56p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701677.

The code LISA (Long term Isolation Safety Assessment), developed at the Joint Research Centre, Ispra is a useful tool in the analysis of the hazard due to the disposal of nuclear waste in geological formations. The risk linked to preestablished release scenarios is assessed by the code in terms of dose rate to a maximum exposed individual. The various submodels in the code simulate the system of barriers -both natural and man made- which are interposed between the contaminants and man. After a description of the code features a guide for the user is supplied and then a test case is presented.

38890 **(EUR—9355) Computer modelling of stresses in rock. Proceedings of a technical session.** Come, B. (ed.). (Commission of the European Communities, Luxembourg). 1984. 249p. (CONF-8312112—). NTIS (US Sales Only), PC A11/MF A01. File Number DE85701678.

From C.E.C. technical session on computer modelling of stresses in rock; Brussels, Belgium (6 Dec 1983).

A part of the research carried out, at Community level, in the field of radioactive waste disposal, concerns the calculation of stresses in the host formations. This particular aspect of rock mechanics studies is of great importance: (a) for designing and constructing safe underground repositories; (b) to predict the "post-closure" behaviour of the rock mass, particularly when submitted to heat release from high-level waste. Adequate calculation tools must be developed for these purposes. In some cases, analytical solutions can be obtained; most of the time, finite-element computer codes are the only method able to solve these difficult problems. CEC contracting partners were invited to present the results of their work in this field, for the period 1980-1983, to identify the issues which can be considered as solved, and to make recommendations for further research. The presentations made, together with the discussions and conclusions, are grouped in this report.

38891 **(EUR—9381) Study of deep fracturation of granitic rock mass. Documentary study.** Bles, J.L.; Landry, J. (Commission of the European Communities, Luxembourg). 1984. 62p. (In French). NTIS (US Sales Only), PC A04/MF A01. File Number DE85701679.

This documentary study realized with the financial support of the European Communities and the CEA aims at the utilization of available data for the understanding of the evolution of natural fractures in granitic rocks from the surface to deep underground. The Mt Blanc road tunnel, the EDF's Arc-Isere gallerie, the Auriat deep borehole and the Pyrenean rock mass of Bassies are studied because detailed structural and geological studies have been realized these last 20 years. More particularly analyzed in this study are the relationship between small fractures and large faults, evolution with depth of fracture density and direction, consequences of rock decompression and relationship between fracturation and groundwater.

38892 **(FRCEA-R—16) Retention of ^{60}Co, ^{85}Sr and ^{137}Cs on inorganic ion exchangers.** Dozol, J.F.; Eymard, S. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)). Nov 1983. 79p. (In French). NTIS (US Sales Only), PC A05/MF A01. File Number DE85751946.

The aim of the study is the treatment of radioactive wastes produced in plutonium fuel fabrication or in spent fuel reprocessing by inorganic ion exchangers for ultimate storage. This report gives the distribution coefficients of ^{60}Co, ^{85}Sr, ^{137}Cs (in sodium nitrate medium at different concentration of sodium: .23g/l, 1 g/l, 10 g/l) obtained with different inorganic exchangers: titanium oxide, sodium titanate, sodium zirconate, sodium niobate, sodium tantalate, titanium phosphate, zirconium phosphate, ammonium phosphotungstate in zirconium phosphate, polyantimonic acid amorphous aluminosilicate and several zeolites (ZBS 15 from OXYMIN, ZEOLON 400, ZEOLON 500, ZEOLON 900 from Norton, IE 96, A 51, 13 X from Union Carbide).

38893 (INIS-mf—9481, pp 56-60) **Fixation of liquid radioactive wastes by cements.** Fendrich, E. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice (Czechoslovakia)). 1982. (In Slovak). NTIS (US Sales Only), PC A10/MF A01. File Number DE85780894. (CONF-8209269—).

From Radionuclides and ionizing radiation in water management conference; Liberec, Czechoslovakia (8 Sep 1982).

In the initial state of the experiment, model solutions are used prepared such as to simulate real wastes. Their pH is 10 to 13, total activity is 0.01 to 1.0 Ci/m^3. The presence of various components of the waste, especially boric acid, unfavourably affects cement hardening.

38894 (INIS-mf—9644, pp 97-119) **Risk and prior compensation in siting low-level nuclear waste facilities. Dealing with the NIMBY syndrome.** Burton, I. (Toronto Univ., Ontario (Canada). Inst. for Environmental Studies); Pushchak, R. (Toronto Univ., Ontario (Canada). Dept. of Geography). 1983. NTIS (US Sales Only), PC A08/MF A01. File Number DE85781436. (CONF-8211206—).

From Seminar on uranium and nuclear issues; Toronto, Ontario, Canada (2 Nov 1982).

Finding a suitable site for a radioactive waste disposal facility within a region is not a unique problem, but resembles other siting difficulties: municipal waste treatment facilities, halfway houses for former mental patients, or nuclear power generating stations. Each serves diffuse regional needs but creates highly localized impacts. In each case local responses to such facilities have been consistent, with host communities using a variety of means to prevent facilities from being sited in their area - the Not in My Back Yard (NIMBY) syndrome. The authors suggest that the NIMBY problem arises because of the spatially inequitable distribution of the risk, both actual and perceived, that is the inevitable outcome of any hazardous facility siting decision. The siting of radioactive waste facilities is not likely to be opposed less vigorously until the conventional siting process includes measures to redress the inequitable distribution of preceived risks. They argue that some form of compensation is the logical refinement in existing siting methods to deal with the NIMBY problem, particularly prior compensation determined through negotiation before the siting decision is finalized.

38895 (INIS-mf—9646, pp 62-63) **Applications of transmission electron microscopy in nuclear waste management.** Cann, C.D.; Hayward, P.J.; Nuttall, K.; Richardson, P.G. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

38896 **(INIS-mf—9654) Disposal facilities on land for low and intermediate-level radioactive wastes: draft principles for the protection of the human environment.** (Department of the Environment, London (UK); Scottish Office, Edinburgh (UK); Welsh Office, Cardiff (UK); Department of the Environment for Northern Ireland, Belfast (UK); Ministry of Agriculture, Fisheries and Food, London (UK)). Oct 1983. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781416.

Views of the authorising Departments under the Radioactive Substances Act 1960.

This document gives the views of the authorising [United Kingdom] Departments under the Radioactive Substances Act 1960 about the principles which those Departments should follow in assessing proposals for land disposal facilities for low and intermediate-level radioactive wastes. It is based on relevant research findings and reports by international bodies; but has been prepared at this stage as a draft on which outside comments are sought, and is subject to revision in the light of those comments. That process of review will lead to the preparation and publication of a definitive statement of principles, which will be an important background document for public inquiries into proposals to develop sites for land disposal facilities. Headings are: authorisation of disposal; other legislation governing new disposal facilities; basic radiological requirements; general principles; information requirements.

38897 **(INIS-mf—9666) Decision in principle of 10 November 1983 on the objectives to be observed in carrying out research, surveys and planning in the field of nuclear waste management.** (International Atomic Energy Agency, Vienna (Austria)). 10 Nov 1982. 3p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781414.

Unofficial English translation by the Finnish Ministry of Trade and Industry.

The Council of State of Finland, in order to have the necessary resources to implement the nuclear waste management measures required from the viewpoint of safety, adopted this Decision in principle on nuclear waste management. The Decision provides for three main objectives to be achieved in the areas of spent fuel management, reactor waste management and nuclear power plant decommissioning.

38898 **(IOS-Rep—185) Assessment of biological processes close to the sea bed in a slope region and its significance to the assessment of sea bed disposal of radioactive waste.** Hargreaves, P.M.; Ellis, C.J.; Angel, M.V. (Institute of Oceanographic Sciences, Godalming (UK)). 1984. 121p. NTIS (US Sales Only), PC A06/MF A01. File Number DE85781084.

Vertical profiles of planktonic and micronektonic biomass observed close to the sea bed along a transect running up the continental slope on the southern flank of the Porcupine Seabight (to the southwest of Ireland) showed that a doubling in biomass concentration occurs from 100 to 10m above the sea bed. Comparison with biomass concentrations at two deep water stations, one in the Seabight and the other in the Rockall Trough, showed that there was a consistent increase in standing crop close to the sea bed over the slope. Supplementary data were collected on the northern flank of the Seabight. Analysis of both taxonomic groups and individual species showed that some taxa were more abundant near the sea floor and extended their vertical ranges to greater depths over the slope than over deep water, other taxa were unaffected. The implications to the problem of assessing the safety of sea bed disposal of high level radioactive waste are summarised.

38899 **(JAERI-M—83-197) Treatment of liquid waste from the production of molybdenum-99 by $^{235}U(n, f)$ ^{99}Mo reaction, 2. Method for treating medium level liquid waste.** Izumo, Mishiroku; Motoki, Ryozo; Onoma, Katsuyuki; Motoishi, Shoji; Iguchi, Akira; Kawakami, Yutaka; Suzuki, Kyohei; Sato, Toshikazu. (Japan Atomic Energy Research Inst., Tokyo). Nov 1983. 37p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701666.

Production and distribution of ^{99}Mo by the reaction of $^{235}U(n, f)$ had been carried out during the period from July 1977 to March 1979. Liquid wastes which arose from this production were divided into three categories of high level, medium level and high radioactive organic liquid wastes, and stored separately. The results of treating work related to the high level liquid waste and organic wastes have already been reported. In this report, the results of experimental work and semi-scale treatment as well as the result of actual liquid wastes($0.6m^3$) treatment are described. As to the method of treatment, U, Pu and ^{144}Ce were initially removed with the electrolysis-filtration process and then ^{90}Sr was removed by using ortho titanic acid column. Futhermore, the residual U and Pu which failed to be removed at initial stage were removed with meta titanic acid column. Consequently, only ^{106}Ru remained in the liquid waste after these procedures. It becomes a more important subject these days to establish the method of removal of ^{106}Ru in the view point of liquid waste reprocessing technology. We applied the column containing the mixture of zinc and charcoal, which has already been reported by us for the removal of ^{106}Ru. Twenty two treatments were conducted within three months started in March 1981 using the treating facility, having a capacity of 30 liters per batch, constructed based on the results of fundamental experiment. As results, following values of the average Decontamination Factor (DF) for overall process were obtained. α-emitting nuclides : 7.0×10^2 β-emitting nuclides : 4.6×10^3 ^{144}Ce : $> 10^5$ ^{137}Cs : 2.8×10^3 ^{106}Ru : 8.4×10^2. Particularly, the column of Zinc-Charcoal mixture showed considerable effectiveness in comparison with the conventional methods.

38900 **(JAERI-M—83-218) Intermediate-Level Waste Treatment Facility in the Tokai Research Establishment.** (Japan Atomic Energy Research Inst., Tokyo). Dec 1983. 117p. (In Japanese). NTIS (US Sales Only), PC A06/MF A01. File Number DE85701667.

Intermediate-Level Waste Treatment Facility was constructed to treat intermediate-level liquid and solid wastes from Power Fuel Examination Facility in the Tokai Establishment. Liquid waste is first treated by evaporation system, then by bituminization system. The former is a natural circulation type evaporator of capacity 0.7 m^3/h and the latter a thermal processor type evaporator with evaporation 80 kg/h. Both systems are mostly in concrete-shielded cells. Solid wastes are reduced in volume by compaction, with sorting and cutting. They are then canned in metallic canisters, which are subsequently put in 200-l concrete-lined drums or 1-m^3 concrete containers, filled with cement. These machines are all in heavy concrete-shielded cells, and are operated remotely. In this report, an outline of the waste treatment facility is given, and the evaporation and bituminization systems and the solid waste treatment system are described.

38901 **(JAERI-M—84-070) Development of partitioning method; partitioning test with nuclear fuel reprocessing waste prepared at PNC, 2.** Yamaguchi, Isoo; Kubota, Masumitsu; Okada, Kenzo; Morita, Yasuji; Nakamura, Haruto. (Japan Atomic Energy Research Inst., Tokyo). Apr 1984. 30p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701668.

The partitioning has been developed under the concepts of separating transuranium elements, ^{90}Sr and ^{137}Cs from a high level fuel reprocessing waste, and then transmuting transuranium elements to fission products with fast neutron and fixing ^{90}Sr and ^{137}Cs as mineral like compound more stable than glass. The present paper describes results of the partitioning test initiated in October of 1982 with about 18 liter(--220 Ci) of the fuel reprocessing waste prepared at PNC. Transuranium elements which are the first objective in the partitioning could be separated in the yield over 99.9 %, and ^{90}Sr and ^{137}Cs over 99.999 %. These results were almost consistent with those of the partitioning tests with about 2 liter of the fuel reprocessing waste prepared at PNC.

38902 **(Juel-Spez—267) Behaviour of radioactive krypton-85 in the deep sea.** Simonis, R.; Bruecher, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Chemische Technologie der Nuklearen Entsorgung). Aug 1984. 86p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE85752021.

If one decides for superordinate reasons in favour of Kr-85 separation during reprocessing then the Kr/Xe noble gas mixture could also be dumped in the deep sea in addition to other possibilities of disposal. Experiments simulating the deep-sea conditions with regard to pressure, temperature and salt content have proved that the noble gas is compressed and successively converted into the hydrate form. In both states it has a clearly higher density than water and therefore tends to sediment. On the conservative assumption that the gas mixture is completely dissolved in sea water and therefore relatively mobile, the Kr activity distribution in the ocean due to flow and diffusion processes in the sea and gas evolution at the surface is assessed. The calculated Kr concentration in the troposphere shows negligibly low radiation doses to the population for all accident scenarios. The authors therefore conclude that dumping of ^{85}Kr in the deep sea is a safe mode for its final disposal.

38903 **(LA—10415-MS) Minerals in fractures of the unsaturated zone from drill core USW G-4, Yucca Mountain, Nye County, Nevada.** Carlos, B.A. (Los Alamos National Lab., NM (USA)). May 1985. Contract W-7405-ENG-36. 56p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85016208.

The mineralogy of fractures in drill core USW G-4, from a depth of nearly 800 ft to the static water level (SWL) at 1770 ft, was examined to determine the sequence of deposition and the identity of minerals that might be natural barriers to radionuclide migration from a nuclear waste repository. Mordenite was found to be present, though not abundant, at the top of the interval sampled (the top of the lower lithophysal zone of the Topopah Spring Member of the Paintbrush Tuff). Heulandite occurs from about 1245 to 1378 ft; below 1378 ft, clinoptilolite rather than heulandite occurs alone or with mordenite. Smectite in fractures is abundant only in the vitrophyre of the Topopah Spring Member of the Paintbrush Tuff and at the top of the Prow Pass member of the Crater Flat Tuff. The unsaturated zone below 800 ft can be divided into three rock types: devitrified, glassy, and zeolitized host rock. Fracture-lining zeolites for each of these three rock types differ in mineralogy and morphology. Similarities, between fracture mineralogy and host-rock alteration in the nonwelded zeolitic units of the Topopah Spring Member suggest that this zone was once below the water table. The difference between microcrystalline ($\geqq 0.01$ mm) fracture coatings in the vitric zone and the mostly cryptocrystalline ($<<0.01$ mm) fracture coatings in the zeolitic zone also suggests that the conditions under which these two types of linings formed were different. Nonwelded glass shards preserved in the host rock above the zeolite-mineral transition in the fractures indicate that the water table was never higher than the lithic-rich base of the Topopah Spring Member in the vicinity of USW G-4. Fracture linings in the zeolitic Topopah Spring Member are clinoptilolite, but the crystal size (0.01 to 0.02 mm) is closer to that of heulandite in fractures of the vitric zone above it than to clinoptilolite in the Tuff of Calico Hills below. 21 refs., 48 figs., 2 tabs.

38904 (LBL—16920, pp 39-41) **TOUGH: a numerical model for strongly heat driven flow in partially saturated media.** Pruess, K. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38905 (LBL—16920, pp 72-74) **Model for partially saturated flow in fractured porous media.** Narasimhan, T.N.; Wang, J.S.Y. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38906 (LBL—16920, pp 79-82) **Thermomechanical response of salt and hard rocks to thermal loading by wastes over 10 years old.** Wang, J.S.Y.; Mangold, D.C.; Tsang, C.F. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38907 (LBL—16920, pp 85-87) **Extent and hydrologic properties of the disturbed rock zone around underground openings in basalt.** Myer, L.R. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38908 (LBL—16920, pp 113-118) **Acoustic emission and wave propagation monitoring at the Spent Fuel Test - Climax.** Majer, E.L.; McEvilly, T.V. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38909 (LBL—16920, pp 172-173) **Hydrothermal alteration of host rocks near buried high-level radioactive waste.** Apps, J.A. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38910 (LBL—16920, pp 174-177) **Geochemistry research planning for underground repositories.** Apps, J.A. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38911 (LBL—16920, pp 183-185) **Thorium species on basalt surfaces.** Perry, D.L.; Tsao, L. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38912 (LBL—16920, pp 185-192) **Analytical performance models for geologic repositories containing radioactive waste.** Pigford, T.H.; Chambre, P.L.; Kobayashi, R.; Kim, C.L.; Lung, H.C.; Takagi, Y.; Williams, W.J.; Zavoshy, S.J. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38913 (LBL—16920, pp 199-202) **Investigation of natural analogs of nuclear waste repository conditions in Columbia River basalt.** Wollenberg, H.A.; Brookins, D.G.; Flexser, S.; Murphy, M. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38914 **(NUREG/CR—3901) Documentation and User's Guide: GS2 and GS3 - variably saturated flow and mass transport models. Final report (including 3 example problems).** Davis, L.A.; Segol, G. (Water, Waste and Land, Inc., Fort Collins, CO (USA)). Jun 1985. 303p. NTIS, PC E12/MF A01 - GPO. File Number TI85901859.

Includes 6 sheets of 48x reduction microfiche.

This report presents documentation and a user's manual for programs GS2 (two-dimensional version) and GS3 (three-dimensional version). Mathematical equations and physical principles utilized to develop the code are presented in Section 2. The numerical approach used (Galerkin Finite Elements) is presented in Section 3. Section 4 presents an overview of how problems should be set up to properly use the code while detailed input instructions are presented in Section 5. Output produced by the code is discussed in Section 6. Three example problems, including sample input data sets and output data, are presented in Section 7. Program information is provided in Section 8. A listing of important program variables along with complete program listings are presented in the Appendices. This report was prepared as part of a project in which NRC staff was presented a training course on how to properly use this computer program. Programs GS2 and GS3 can be utilized to analyze flow and mass transport in unsaturated, partially saturated, or fully saturated flow regions. It is anticipated that the NRC will use the model for checking information provided by a licensee, for evaluating alternative sites and designs for waste disposal, and for comparing their results with results from other methods of solution. Three example problems are presented in microfiche in the back pocket. 16 refs.

38915 **(NUREG/CR—4268) Ratio methods for cost-effective field sampling of commercial radioactive low-level wastes.** Eberhardt, L.L.; Simmons, M.A.; Thomas, J.M. (Pacific Northwest Labs., Richland, WA (USA)). Jul 1985. Contract AC06-76RL01830. 78p. (PNL—5156). NTIS, PC A05/MF A01 - GPO. File Number TI85015820.

In many field studies to determine the quantities of radioactivity at commercial low-level radioactive waste sites, preliminary appraisals are made with field radiation detectors, or other relatively inaccurate devices. More accurate determinations are subsequently made with procedures requiring chemical separations or other expensive analyses. Costs of these laboratory determinations are often large, so that adequate sampling may not be achieved due to budget limitations. In this report, we propose double sampling as a way to combine the expensive and inexpensive aproaches to substantially reduce overall costs. The underlying theory was developed for human and agricultural surveys, and is partially based on assumptions that are not appropriate for commercial low-level waste sites. Consequently, extensive computer simulations were conducted to determine whether the results can be applied in circumstances of importance to the Nuclear Regulatory Commission. This report gives the simulation details, and concludes that the principal equations are appropriate for most studies at commercial low-level waste sites. A few points require further research, using actual commercial low-level radioactive waste site data. The final section of the report provides some guidance (via an example) for the field use of double sampling. Details of the simulation programs are available from the authors. Major findings are listed in the Executive Summary. 9 refs., 9 figs., 30 tabs.

38916 **(NUREG/CR—4271) Recommended safety, reliability, quality assurance and management aerospace techniques with possible application by the DOE to the high-level radioactive waste repository program.** Bland, W.M. Jr. (Management and Technical Consulting, Houston, TX (USA)). May 1985. 111p. NTIS, PC A06/MF A01 - GPO. File Number TI85901741.

Aerospace SRQA and management techniques, principally those developed and used by the NASA Lyndon B. Johnson Space Center on the manned space flight programs, have been assessed for possible application by the DOE and the DOE-contractors to the high level radioactive waste repository program that results from the implementation of the NWPA of 1982. Those techniques believed to have the greatest potential for usefulness to the DOE and the DOE-contractors have been discussed in detail and are recommended to the DOE for adoption; discussion is provided for the manner in which this transfer of technology can be implemented. Six SRQA techniques and two management techniques are recommended for adoption by the DOE; included with the management techniques is a recommendation for the DOE to include a licensing interface with the NRC in the application of the milestone reviews technique. Three other techniques are recommended for study by the DOE for possible adaptation to the DOE program.

38917 **(OAP-IE—84-90) Ocean disposal of heat generating radioactive waste. Container design study.** (Ove Arup and Partners, London (UK); Department of the Environment, London (UK)). Dec 1984. 91p. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781314.

A study of container designs for heat generating radioactive waste disposal in the deep ocean sediments is presented. The purpose of the container would be to isolate the waste from the environment for a period of 500 to 1000 years. The container designs proposed are based on the use of either corrosion allowance or corrosion resistant metals. Appropriate overpack wall thicknesses are suggested for each design using the results of corrosion studies and experiments but these are necessarily preliminary and data relevant to corrosion in deep ocean sediments remain sparse. It is concluded that the most promising design concept involves a thin titanium alloy overpack in which all internal void spaces are filled with lead or cement grout. In situ temperatures for the sediment adjacent to

the emplaced 50 year cooled waste containers are calculated to reach about 260 deg C. The behaviour of the sediments at such a high temperature is not well understood and the possibility of 100 years interim storage is recommended for consideration to allow further cooling. Further corrosion data and sediment thermal studies would be required to fully confirm the engineering feasibility of these designs.

38918 **(ORNL/TM—9362) Geophysical investigations at ORNL solid waste storage area 3.** Rothschild, E.R.; Switek, J.; Llopis, J.L.; Farmer, C.D. (Oak Ridge National Lab., TN (USA)). Jul 1985. Contract AC05-84OR21400. 40p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015054.

Geophysical investigations at ORNL solid waste storage area 3 have been carried out. The investigations included very-low-frequency-electromagnetic resistivity (VLF-EM), electrical resistivity, and seismic refraction surveys. The surveys resulted in the measurement of basic geophysical rock properties, as well as information on the depth of weathering and the configuration of the bedrock surface beneath the study area. Survey results also indicate that a number of geophysical anomalies occur in the shallow subsurface at the site. In particular, a linear feature running across the geologic strike in the western half of the waste disposal facility has been identified. This feature may conduct water in the subsurface. The geophysical investigations are part of an ongoing effort to characterize the site's hydrogeology, and the data presented will be valuable in directing future drilling and investigations at the site. 10 refs., 6 figs.

38919 **(PNL—4250-7) Nuclear Waste Management. Semiannual progress report, October 1984-March 1985.** McElroy, J.L.; Powell, J.A. (comps.). (Pacific Northwest Labs., Richland, WA (USA)). Jun 1985. Contract AC06-76RL01830. 97p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85015236.

Progress reports are presented for the following studies on radioactive waste management: defense waste technology; nuclear waste materials characterization center; and supporting studies. 19 figs., 29 tabs.

38920 **(PNL—5393) Design features of the radioactive Liquid-Fed Ceramic Melter system.** Holton, L.K. Jr. (comp.). (Pacific Northwest Labs., Richland, WA (USA)). Jun 1985. Contract AC06-76RL01830. 128p. NTIS, PC A07/MF A01; GPO Dep. File Number DE85015418.

During 1983, the Pacific Northwest Laboratory (PNL), at the request of the Department of Energy (DOE), undertook a program with the principal objective of testing the Liquid-Fed Ceramic Melter (LFCM) process in actual radioactive operations. This activity, termed the Radioactive LFCM (RLFCM) Operations is being conducted in existing shielded hot-cell facilities in B-Cell of the 324 Building, 300 Area, located at Hanford, Washington. This report summarizes the design features of the RLFCM system. These features include: a waste preparation and feed system which uses pulse-agitated waste preparation tanks for waste slurry agitation and an air displacement slurry pump for transferring waste slurries to the LFCM; a waste vitrification system (LFCM) - the design features, design approach, and reasoning for the design of the LFCM are described; a canister-handling turntable for positioning canisters underneath the RLFCM discharge port; a gamma source positioning and detection system for monitoring the glass fill level of the product canisters; and a primary off-gas treatment system for removing the majority of the radionuclide contamination from the RLFCM off gas. 8 refs., 48 figs., 6 tabs.

38921 **(PNL—5470-1) Commercial LFCM vitrification technology. Quarterly progress report, October-December 1984.** Burkholder, H.C.; Jarrett, J.H. (comps.). (Pacific Northwest Labs., Richland, WA (USA)). Jul 1985. Contract AC06-76RL01830. 113p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE85015808.

This report is the first in a series of quarterly reports compiled by the Nuclear Waste Treatment Program Office at Pacific Northwest Laboratory to document progress on commercial liquid-fed ceramic melter (LFCM) vitrification technology. Progress in the following technical subject areas during the first quarter of FY 1985 is discussed: pretreatment systems, melting process chemistry, glass development and characterization, feed preparation and transfer systems, melter systems, canister filling and handling systems, off-gas systems, process/product modeling and control, and supporting studies. 33 figs., 12 tabs.

38922 **(PNL—5488) Prediction equations for corrosion rates of a A-537 and A-516 steels in Double Shell Slurry, Future PUREX, and Hanford Facilities Wastes.** Divine, J.R.; Bowen, W.M.; Mackey, D.B.; Bates, D.J.; Pool, K.H. (Pacific Northwest Labs., Richland, WA (USA)). Jun 1985. Contract AC06-76RL01830. 58p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85015231.

Even though the interest in the corrosion of radwaste tanks goes back to the mid-1940's when waste storage was begun, and a fair amount of corrosion work has been done since then, the changes in processes and waste types have outpaced the development of new data pertinent to the new double shell tanks. As a consequence, Pacific Northwest Laboratory (PNL) began a development of corrosion data on a broad base of waste compositions in 1980. The objective of the program was to provide operations personnel with corrosion rate data as a function of waste temperature and composition. The work performed in this program examined A-537 tank steel in Double Shell Slurry and Future PUREX Wastes, at temperatures between 40 and 180°C as well as in Hanford Facilities Waste at 25 and 50°C. In general, the corrosion rates were less than 1 mpy (0.001 in./y) and usually less than 0.5 mpy. Excessive corrosion rates (>1 mpy) were only found in dilute waste compositions or in concentrated caustic compositions at temperatures above 140°C. Stress corrosion cracking was only observed under similar conditions. The results are presented as polynomial prediction equations with examples of the output of existing computer codes. The codes are not provided in the text but are available from the authors. 12 refs., 5 figs., 19 tabs.

38923 **(RHO-BW-SA—412P) Determination of rock mass deformation modulus during hydraulic fracturing.** Dischler, S.A.; Kim, K. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Jun 1985. Contract AC06-77RL01030. 21p. (CONF-850671—20). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014938.

From 26. U.S. symposium on rock mechanics; Rapid City, SD, USA (26 Jun 1985).

This paper presents the results from prototype testing of a new device developed to determine the rock mass deformation modulus during hydraulic fracturing stress measurements. The tool combines a modified US Bureau of Mines borehole deformation gage and standard hydraulic fracturing straddle packers to allow displacement measurements of the borehole wall along the diametrical axes in the pressurized test interval. The deformation modulus is evaluated through utilization of a closed-form elastic solution for a thick-walled cylinder, and the magnitudes and orientations of the in situ stress field are concurrently determined by conventional methods. Enhancement of hydraulic fracturing data interpretation may also be possible by using borehole displacement measurements to monitor induced fracture propagation and improve the definition of breakdown, fracture reopening, and shut-in pressures. 13 refs., 7 figs., 1 tab.

38924 **(RHO-PB-SR—10-B-WM-Mar.85) Defense waste and byproducts management monthly report.** (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Mar 1985. Contract AC06-77RL01030. 105p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE85014663.

During the month of March, Tanks 106-B and 107-B were declared Interim Stabilized. These two tanks were supernate pumped. Fiscal-year-to-date, twelve single-shell tanks were declared stabilized; five tanks were administratively declared stabilized, three tanks were jet pumped, and four tanks were supernate pumped. Eighty-five of 149 single-shell tanks have been stabilized since the Program began. Supernate pumping of selected single shell tanks continued. Pumping was completed for Tanks 104-B, 109-B and 111-B. Pumping of selected catch tanks, vaults, and sumps is ongoing in support of Isolation Project B-231. During the

month of March, approximately 65,000 gallons of liquid was pumped from single-shell tank farms; approximately 232,000 gallons of liquid has been pumped FYTD. A total of 134 capsules containing approximately 6.3 MCi of cesium was shipped to Iotech, Inc. this month. To date, 142 capsules have been shipped to Iotech. The remaining 102 capsules identified in the Iotech contract will be shipped during April.

38925 **(RHO-PB-SR—10-B-WM-May-85) Defense waste and byproducts management monthly report, 1985.** (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). May 1985. Contract AC06-77RL01030. 103p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE85014664.

During the month of May Tanks 108-B and 112-B, which had been previously supernate pumped, were declared interim stabilized. Tank 202-B was also declared interim stabilized subsequent to an engineering evaluation of tank contents. FYTD, sixteen single-shell tanks have been declared stabilized. Eighty-nine of 149 tanks have been stabilized since the Program began. Evaporator Run 85-4 continued in May. The monthly evaporator throughput was about 2.7 million gallons. FYTD evaporator throughput is approximately 14.1 million gallons with a waste volume reduction of about 4.5 million gallons. During the month approximately 56,000 gallons of liquid were pumped from single-shell tank farms and facilities; approximately 340,000 gallons has been pumped FYTD. The last of the 16 Submerged Demineralizer System (SDS) vessels which DOE agreed to accept from TMI for burial in the 200 West area has been buried.

38926 **(SAND—84-0804C) Implementation of thermal/structural interactions in situ tests at the Waste Isolation Pilot Plant facility.** Munson, D.E.; Matalucci, R.V.; Torres, T.M. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 53p. (CONF-850938—1). NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85006106.

From 2. conference on the mechanical behavior of salt; Hannover, F.R. Germany (24 Sep 1985).

Several large-scale, well-instrumented underground tests to determine the in situ thermal/structural response of bedded salt are currently being constructed at the Waste Isolation Pilot Plant (WIPP) facility in southeastern New Mexico. These tests are an essential component of a broad research and development program to resolve thermal/structural issues, to validate long-term prediction methods, and to develop a design basis for a future repository. They are the result of an extensive planning and evaluation procedure to determine appropriate test configurations. The scale of these tests can be judged from the 3022 active remote-reading data channels, 1190 active remote-control channels, and 710 manual data inputs from more than 3700 individual gages distributed among the six test rooms (four experiments). Implementing tests of this magnitude is a major effort in design, preparatory activities, fielding, and quality assurance controls. In this paper we treat an approach to fielding these tests, selecting hardware, developing appropriate technology, and evantually putting the tests into place. 24 refs., 12 figs., 5 tabs.

38927 **(SAND—84-2636) 1983 Subseabed Disposal Program: geotechnical laboratory and modeling studies. Annual report, October 1982-September 1983.** Lipkin, J. (ed.). (Sandia National Labs., Livermore, CA (USA)). Jul 1985. Contract AC04-76DP00789. 660p. NTIS, PC A99/MF A01; 1; GPO Dep. File Number DE85016031.

This document describes the laboratory and modeling efforts necessary to characterize marine sediment responses to the combined thermal and mechanical loading histories of interest to the Subseabed Disposal Program (SDP). Laboratory efforts are related to three areas in the SDP: (1) site studies, (2) data acquisition to support model development, and (3) assessment of model validity. Modeling efforts focus on the sediment responses associated with emplacement activities and the long-term interactions between the sediment and a waste canister. The appendices of the document present detailed results obtained by SDP Principal Investigators involved in geotechnical studies during fiscal year 1983. 3 refs., 6 figs., 2 tabs.

38928 **(SAND—84-7209) Feasibility studies and conceptual design for placing steel liner in long, horizontal boreholes for a prospective nuclear waste repository in tuff.** (Robbins Co., Kent, WA (USA)). Jul 1985. Contract AC04-76DP00789. 68p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85014931.

Sandia National Laboratories Report SAND83-7085 analyzed vertical and horizontal methods of drilling holes for emplacement of nuclear waste canisters in a repository in tuff. While the horizontal method showed a significant cost advantage, the risk of hole blockage due to rock falls is higher. This report addresses the possibility of emplacing a steel casing simultaneously with drilling the hole. It appears that a drill could be developed that could be removed for repair from a partially complete hole and then reinstalled to complete drilling. A conceptual design featuring an eccentric cutterhead was completed. Capital and operating costs, as well as an operational schedule, were developed for the drill unit. 2 refs., 4 figs., 2 tabs.

38929 **(SAND—85-0024C) Determining probabilities of geologic events and processes.** Hunter, R.L.; Mann, C.J.; Cranwell, R.M. (Sandia National Labs., Albuquerque, NM (USA); Illinois Univ., Urbana (USA). Dept. of Geology). 1985. Contract AC04-76DP00789. 10p. (CONF-850918—3). NTIS, PC A02/MF A01 - GPO. File Number TI85014642.

From International topical meeting on high level nuclear waste disposal - technology and engineering; Pasco, WA, USA (24 Sep 1985).

The Environmental Protection Agency has recently published a probabilistic standard for releases of high-level radioactive waste from a mined geologic repository. The standard sets limits for contaminant releases with more than one chance in 100 of occurring within 10,000 years, and less strict limits for releases of lower probability. The standard offers no methods for determining probabilities of geologic events and processes, and no consensus exists in the waste-management community on how to do this. Sandia National Laboratories is developing a general method for determining probabilities of a given set of geologic events and processes. In addition, we will develop a repeatable method for dealing with events and processes whose probability cannot be determined. 22 refs., 4 figs.

38930 **(SAND—85-0773C) Sensitivity of calculated hydrological flows through multilayered hard rock to computational solution procedures.** Bixler, N.E.; Eaton, R.R. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 16p. (CONF-8505180—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015152.

From Symposium on groundwater flow and transport modeling for performance assessment of deep geologic disposal of radioactive waste; Albuquerque, NM, USA (20 May 1985).

Permeability and moisture content curves for partially saturated, fractured, welded tuffs, such as those found near the site of a prospective nuclear waste repository at Yucca Mountain, Nevada, are highly nonlinear. We illustrate, by means of one-dimensional infiltration in multilayered fractured tuff, the numerical instabilities that can arise when analyzing the flow in such porous materials. We compare the results obtained using two numerical schemes for treating the nonlinearities: the first uses a first-order Piccard iteration scheme to attain convergence at each time step; the second uses a second-order Newton-Raphson iteration procedure to attain convergence. The Piccard scheme converges when flow through the rock matrix dominates but does not converge when flow through fractures dominates. On the other hand, the Newton-Raphson scheme converges in both situations. 6 refs., 10 figs.

38931 **(SKBF-KBS-TR—83-75) Geochemical behavior of protactinium 231 and its chosen geochemical analogue thorium in the biosphere.** Gillberg-Wickman, M. (Swedish Nuclear Fuel Supply Co., Stockholm. Div. KBS). Mar 1983. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781315.

To be able to judge whether protactinium 231 might represent a major contribution to the human radiation risk from high level radioactive waste a literature study of the geochemical behav-

ior of protactinium has been made. The interest in protactinium determinations has, as far, been in the field of marine geochemistry and geochronology. These investigations show that thorium may be used as a chemical analogue. The content of protactinium 231 is determined by the ^{235}U content and consequently the occurrence of protactinium in nature is directly associated to the geochemistry of uranium. The pronounced hydrolytic tendency of protactinium and its great sorption and coprecipitation capacity ought to prevent or at least appreciably delay its transport from a back-filled nuclear waste vault to the uppermost surface of the earth. It also has a tendency to form colloids or particulates which may be strongly fixed on a rock surface. In adsorption and desorption processes kinetics must play an important role. Our knowledge in this field is quite limited. Under the physico-chemical conditions in the sea, protactinium is rapidly scavenged from the water column by particulates. It accumulates in the sediments. 23 references.

38932 **(SKBF-KBS-TR—83-76) Proceedings of the third spent fuel workshop.** Werme, L. (ed.). (Swedish Nuclear Fuel Supply Co., Stockholm. Div. KBS). Mar 1984. 52p. (CONF-8311251—). NTIS (US Sales Only), PC A04/MF A01. File Number DE85781316.

From 3. spent fuel workshop; Boston, MA, USA (10 Nov 1983).

The third workshop, held in Boston, Mass. November 10-11, 1983 was organized by Battelle PNL. Questions concerning spent fuel behaviour in nuclear waste repositories were discussed. The following three lectures were presented. The corrosion of Spent UO_2-Fuel in Synthetic Groundwater, R.S. Forsyth, K. Svanberg and L.O. Werme. Leaching and Radiolysis Studies on UO_2 Fuel, L.H. Johnson, S. Stroes-Gascoyne, D.W. Shoesmith, M.G. Bailey and D.M. Sellinger. Comparison of Spent Fuel and UO_2 Release in Salt Brines, W.J. Gray and G.L. McVay.

38933 **(SKBF-KBS-TR—84-01) Radionuclide transport in a single fissure. A laboratory study of Am, Np, and Tc.** Eriksen, T.E. (Swedish Nuclear Fuel Supply Co., Stockholm). Jan 1984. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781317.

Radionuclide migration has been studied in natural fissures running parallel to the axes of granitic drill cores. A short pulse of radionuclide solution was injected at one end of the fissure and the temporal change in radionuclide concentration of the eluate measured. At the end of each experiment the fissure was opened and the radionuclide distribution on the fissure surfaces measured. The retardation of ^{241}Am(III) at pH 8.2 as well as the variation in ^{235}Np(V) retardation with pH are found to be in good agreement with K d-values obtained in batch experiments. The reduction of (TcO^-_4) to Tc(IV) leads as expected to increasing retardation.

38934 **(UCRL—53606) Parametric testing of a DWPF glass.** Bazan, F.; Rego, J. (Lawrence Livermore National Lab., CA (USA)). Mar 1985. Contract W-7405-ENG-48. 85p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85015087.

A series of tests has been performed to characterize the chemical stability of a DWPF borosilicate glass sample as part of the Waste Package Task of the Nevada Nuclear Waste Storage Investigations (NNWSI) Project. This material was prepared at the Savannah River Laboratory for the purpose of testing the 165-frit matrix doped with a simulated nonradioactive waste. All tests were conducted at 90°C using deionized water and J-13 water (a tuffaceous formation ground water). In the deionized water tests, both monoliths and crushed glass were tested at various ratios of surface area of the sample to volume of water in order to compare leach rates for different sample geometries or leaching times. Effects on the leach rates as a result of the presence of crushed tuff and stainless steel material were also investigated in the tests with J-13 water. 3 refs., 12 figs., 7 tabs.

38935 **(UCRL—93012) Transuranic waste: long-term planning.** Young, K.C. (Lawrence Livermore National Lab., CA (USA)). Jul 1985. Contract W-7405-ENG-48. 9p. (CONF-850723—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015175.

From 7. international system safety conference; San Jose, CA, USA (25 Jul 1985).

Societal concerns for the safe handling and disposal of toxic waste are behind many of the regulations and the control measures in effect today. Transuranic waste, a specific category of toxic (radioactive) waste, serves as a good example of how regulations and controls impact changes in waste processing - and vice versa. As problems would arise with waste processing, changes would be instituted. These changes improved techniques for handling and disposal of transuranic waste, reduced the risk of breached containment, and were usually linked with regulatory changes. Today, however, we face a greater public awareness of and concern for toxic waste control; thus, we must anticipate potential problems and work on resolving them before they can become real problems. System safety analyses are valuable aids in long-term planning for operations involving transuranic as well as other toxic materials. Examples of specific system safety analytical methods demonstrate how problems can be anticipated and resolution initiated in a timely manner having minimal impacts upon allocation of resource and operational goals. 7 refs., 1 fig.

38936 **Pyrochemical development at Rocky Flats for recovery and purification of plutonium.** Baldwin, C.E. (Rockwell Intl., Rocky Flats Plant, Golden, CO). pp 41-63 of Actinide Recovery from Waste and Low-Grade Sources. Navratil, J.D.; Schulz, W.W. New York, NY; Harwood Academic Publishers (1982). (CONF-810899—).

From Actinide recovery symposium; New York, NY, USA (24 Aug 1981).

Residues that are rich in plutonium are generated during production operations at Rocky Flats and must be processed to recover the plutonium. These residues include such things as foundry skulls and oxides and impure plutonium metal. The current method for recovering plutonium from these materials is based on an aqueous process. This recovery can be accomplished in significantly less time and with the generation of much less waste, however, using the pyrochemical processes of direct oxide reduction (DOR) to convert the oxides directly to metal and electrorefining (ER) to purify the metal. Although these pyrochemical techniques have been used in production for a number of years, new equipment has been developed which is much more efficient. The features and advantages of the new equipment as applied to DOR and ER will be presented.

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 38864, 38872, 38875, 38878, 38915, 38934, 38953, 40173

38937 **(AECL—7801) Parameter-sensitivity analysis of near-field radionuclide transport in buffer material and rock for an underground nuclear fuel waste vault.** Cheung, S.C.H.; Chan, T. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Aug 1983. 38p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85900469.

An analytical model has been developed for radionuclide transport in the vicinity of a nuclear fuel waste container emplaced in a borehole. The model considers diffusion in the buffer surrounding the waste container, and both diffusion and groundwater convection in the rock around the borehole. A parameter-sensitivity analysis has been done to study the effects on radionuclide flux of (a) Darcian velocity of groundwater in the rock, (b) effective porosity of the buffer, (c) porosity of the rock, (d) radial buffer thickness, and (e) radius and length of the container. It is found that the radionuclide flux, Fsub(R), and the total integrated flux, Fsub(T), are greater for horizontal flow than for vertical flow; Fsub(R) decreases with increasing radial buffer thickness for all Darcian velocities, whereas Fsub(T) decreases at high velocities but increases at low velocities. The rate of change of Fsub(R) and of Fsub(T) decreases with decreasing flow velocity and increasing buffer thickness; Fsub(R) is greater for higher effective porosity of buffer or rock; and Fsub(R) increases and Fsub(T) decreases with decreasing container radius or length.

38938 **(ANS—399) ECOS: sorption, dose, consumption and miscellaneous data values.** Kane, P. (Associated Nuclear Services, Epsom (UK)). Oct 1984. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781083.

This report describes the nature of the data stored within the program ECOS, lists the values currently used and references the sources used. Also included are the element-specific equilibrium distribution coefficients (K/sub D/) which are held in a data file external to ECOS. Nuclide-specific decay constants and dose factors are presented, as are certain plant- and animal-specific data not included in external files. Several miscellaneous items of data stored within ECOS are described. None of the data stored within ECOS are accessible to the user.

38939 **(EPS-4-ES—83-1) Long-term ecological behaviour of abandoned uranium mill tailings. 1. Synoptic survey and identification of invading biota.** Kalin, M. (Environment Canada, Ottawa, Ontario. Environmental Protection Service). Mar 1983. 147p. NTIS (US Sales Only), PC A07/MF A01. File Number DE85701631.

Inactive uranium mill tailings were surveyed in the Province of Ontario to describe their surface characteristics, identify naturally invading biota, and determine essential chemical and physical parameters associated with the tailings. Inactive tailings sites can have wet areas, tailings completely covered with water, and dry areas. In the wet areas of most sites, wetland vegetation stands were found which were dominated by species of cattails (Typhaceae), along with some species of rushes (Juncaceae) and sedges (Cyperceae). Dry areas of the tailings exhibited a variety of surface features which are often a reflection of different amelioration efforts. Most of the indigenous species of vascular plants identified on dry areas of the tailings occurred only sporadically. Invading plants found on most sites were the tree species, trembling aspen (Populus tremuloides) and paper birch (Betula papyrifera). Elemental concentration and some physical characteristics of the tailings collected from a depth of 0-20 cm were determined. Uptake of heavy metals and radionuclides were evaluated in trees found in the dry areas and in cattails (Typha latifolia) in the wetland areas. Water bodies on tailings and surface water leaving the tailings, before and after treatment, were characterized in this survey. Aquatic bryophytes have invaded some water bodies on the tailings, and acid tolerant algae were evident in most of the water associated with the tailings. Ecological processes occurring on inactive uranium mill tailings which were identified in this survey are essential in evaluating the long-term fate of these waste sites.

38940 **(EUR—9304) CEC coordinated project MIRAGE MIgration of RAdionuclides in the GEosphere.** (Commission of the European Communities, Luxembourg). 1984. 67p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701620.

The coordinated project "Mirage" corresponds to the follow-up in the field of migration, from 1983 onwards, of the present activities of the laboratories of the Member States, up to the end of 1984, and of the Joint Research Centre at Ispra, up to the end of 1983. It is concentrated upon the study of the transfer of radioactivity from conditioned waste through the different barriers up to the interface between the geosphere and the biosphere.

38941 **(EUR—9401) Lagrangian current measurements and large-scale long-term dispersion rates (Sofar float experiment).** Gurbutt, F.A. (Commission of the European Communities, Luxembourg). 1984. 26p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701622.

Activity entering the water from a deep-sea disposal of radioactive waste package will be dispersed through the ocean both by the long-term circulation pattern and the eddy (mixing) motions. Sofar floats are thought to be the most cost-effective way of obtaining direct information on the circulation over a few years and the only way to obtain information, in the Lagrangian framework, on the statistics of the eddy movements. The Sofar float experiment seeks to answer questions including: (a) What is the magnitude of space and time variability of the horizontal eddy kinetic energy in the eastern bassin and is it consistent with that found in the western basin of the North Atlantic. (b) Is the deep flow inferred from incoherent arrays of moored current meters correct. The report covers the preparation stage for the Sofar float experiment whick takes place from autumn 1984 to 1986. It describes the recent results from the western North Atlantic, the design of the new deep Sofar float, the testing of the float including the range at which these new floats can be heard, the experimental design and expected results.

38942 (INIS-mf—9532, pp 50-54) **Nuclear fuel cycle. Considerations for a small nation.** Lowenberg, H. (Nuclear Regulatory Commission, Washington, DC (USA)). 1983. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780892. (CONF-831241—Summ.).

From Joint US/Israeli meeting on safety and siting problems for power reactors in a small country; Haifa, Israel (20 Dec 1983). Published in summary form only.

38943 (INIS-mf—9644, pp 81-96) **Environmental issues related to uranium mining.** Gorber, D.M.; Chambers, D.B. (Senes Consultants, Willowdale, Ontario (Canada)). 1983. NTIS (US Sales Only), PC A08/MF A01. File Number DE85781436. (CONF-8211206—).

From Seminar on uranium and nuclear issues; Toronto, Ontario, Canada (2 Nov 1982).

This paper introduces the environmental issues (both real and perceived) associated with uranium exploration, mining, milling, and tailings management. Also, some of the issues pertaining to the closeout of uranium tailings areas are discussed. These issues have received considerable attention in Canada in public inquiries and hearings that have been held across the country. The major conclusions of some of these hearings are also noted.

38944 (LBL—16920, pp 75-77) **Simulation of evaporation from the uranium mill tailings pile at Riverton, Wyoming.** Tokunaga, T.; Narasimhan, T.N. (Lawrence Berkeley Lab., CA). Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38945 (LBL—16920, pp 77-78) **DYNAMIX: a computer program for multiple-species chemical transport with precipitation and dissolution.** Narasimhan, T.N. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38946 (LBL—16920, pp 192-196) **Behavior of americium in aqueous carbonate systems.** Silva, R.J. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38947 (LBL—16920, pp 196-199) **Chemical mixing model describing groundwater contamination from an inactive uranium mill tailings pile.** White, A.F.; Delany, J.M.; Narasimhan, T.N.; Smith, A.R. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38948 (LBL—16920, pp 202-205) **Thermodynamic coupling of transport processes in near-field regions of nuclear waste repositories.** Carnahan, C.L. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

38949 **(RHO-BW-CR—148P) REPREL computer code: users guide.** Eslinger, P.W.; Sagar, B. (BCS Richland, Inc., WA (USA); Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Jun 1985. Contract AC06-77RL01030. 79p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85015252.

A major part of the current Basalt Waste Isolation Project (BWIP) effort is directed at analyzing postclosure repository performance. These analyses will determine how well the proposed repository system achieves its design objectives and, in turn, how well the system complies with technical criteria and standards set by federal agencies. One of the performance measures is the fractional rate of mass release at the immediate boundary of the collec-

tion of waste containers. Estimation of radionuclide releases from a geologic repository at the boundary of the waste packages is required for two reasons: (1) to judge whether the engineered barrier system complies with the performance regulations prescribed by the US Nuclear Regulatory Commission and the US Environmental Protection Agency and (2) to obtain the value of radionuclide source term needed to model mass transport in the near and far fields of the repository. The REPREL computer code provides a tool for integrating the mass release over the repository based on a random sequence of container failure times as a function of corrosion and the expected release from a single container failing at a given time. The original version of REPREL was developed by BCS Richland, Inc. (BCSR) for use by Rockwell Hanford Operations (Rockwell) at the BWIP site. The original version is currently in use and is designated as version 1.0. The REPREL code is a stand-alone FORTRAN program, features and options of which are machine independent. This document is intended to serve as a guide to operation of version 1.0 of REPREL and is tailored to the code documentation specification suggested by Silling (1983). The mathematical model embodied by REPREL is summarized in 2.0, while detailed instructions for operation of the code are provided in 3.0, and a nomenclature list that defines all terms is provided in 4.0. A detailed treatment of an illustrative example problem is given in Appendix B. 7 refs.

38950 **(SAND—85-0829C) Preliminary assessment of radionuclide vapor phase transport in unsaturated tuff.** Smith, D.M.; Updegraff, C.D.; Bonano, E.J. (New Mexico Univ., Albuquerque (USA). Dept. of Chemical and Nuclear Engineering; Science Applications International Corp., Albuquerque, NM (USA); Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 14p. (CONF-8505180—1). NTIS, PC A02/MF A01 - GPO; GPO Dep. File Number TI85014333.

From Symposium on groundwater flow and transport modeling for performance assessment of deep geologic disposal of radioactive waste; Albuquerque, NM, USA (20 May 1985).

The possibility of radionuclide migration in the vapor phase for unsaturated tuff has been investigated. Radionuclide movement could be the result of either aerosol migration or convection/diffusion of volatile species. A diffusion model for supersaturation of air in tuff groundwater indicates that there is no possibility of aerosol formation under expected repository conditions. An assessment of migration due to convection/diffusion requires solution of the coupled heat transfer-vapor flow-liquid flow problem around a waste canister. The TOUGH code has been used to calculate spatial and temporal distributions of liquid and vapor velocity, saturation and temperature for typical tuff formation properties. These distributions have been used to calculate the relative transport rates due to convection in the vapor phase as compared to the liquid phase. An analogous mobility ratio when diffusion dominates radionuclide transport has also been calculated. As a first order approximation, the maximum ratio of transport in the vapor phase to that in the liquid phase (irregardless of transport mechanism) is given by 1000 K/sub w/ where K/sub w/ is the vapor-liquid distribution coefficient (i.e., vapor concentration/liquid concentration) for the particular radionuclide. 13 refs., 3 figs.

38951 **(SKBF-KBS-SP-IR—83-04) Buffer mass test - Site documentation.** Pusch, R. (Swedish Nuclear Fuel Supply Co., Stockholm. Div. KBS). Oct 1983. 55p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701874.

The purpose of this report is to compile test site data that are assumed to be of importance for the interpretation of the Buffer Mass Test. Since this test mainly concerns water uptake and migration processes in the integrated rock/backfill system and the development of temperature fields in this system, the work has been focused on the constitution and hydrology of the rock. The major constitutional rock feature of interest for the BMT is the frequency and distribution of joints and fractures. The development of models for water uptake into the highly compacted bentonite in the heater holes requires a very detailed fracture survey. The present investigation shows that two of the holes (No. 1 and 2) are located in richly fractured rock, while the others are located in fracture-poor to moderately fractured rock. The hydrological conditions of the rock in the BMT area are characterized by water pressures of as much as 100 m water head at a few meters distance from the test site. The average hydraulic conductivity of the rock that confines the BMT tunnel has been estimated at about 10^{-10} m/s by Lawrence Laboratory. The actual distribution of the water that enters the tunnel has been estimated by observing the successive moistening after having switched off the ventilation, and this has offered basis of predicting the rate and uniformity of the water uptake in the tunnel backfill. As to the heater holes the detailed fracture patterns and various inflow measurements have yielded a similar basis. The report also gives major data on the rock temperature, gas conditions, mineralogy, rock mechanics, and groundwater chemistry for BMT purposes.

0540 Health And Safety

REFER ALSO TO CITATION(S) 38866, 38875, 38929, 38953

38952 (EPRI-NP—3912-SR-Vol.2, pp 80.1-80.10) **Application of probabilistic risk assessments in demonstrating the adequacy of safety in the design of nuclear chemical plants.** Hensley, G. (British Nuclear Fuels Place, Warrington, England). Feb 1985. Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303 $125.00. File Number TI85920542. (CONF-850206—Vol.2).

From International ANS/ENS topical meeting on probabilistic safety methods and applications; San Francisco, CA, USA (24 Feb 1985).

The reprocessing of irradiated nuclear fuel is carried out at British Nuclear Fuels Place (BNFL) Sellafield works in Cumbria by the Reprocessing Operations Division. The design of new nuclear chemical plants for Sellafield is done at Risley, Warrington, by the Reprocessing Engineering Division, the capital investment over the next decade being some £ 2000 million. The nature, throughput and inventory of radioactive materials involved in these processes necessitates very high standards of safety in the design (and operation) of the program of major new plants. Comprehensive safety analyses are prepared for each plant involving probabilistic risk assessments (PRA). The paper comments on the application of PRA in developing safety assessment to show that the proposed designs will result in adequately safe plant, the influence this has had on design and operation and limitations that are being experienced with the use of PRA.

0550 Regulations

REFER ALSO TO CITATION(S) 38845, 38859, 38863, 39163, 39211, 39399, 40906

38953 **(CRS-WP—24) Costs of uncertainty: regulating health and safety in the Canadian uranium industry.** Robinson, I. (Queen's Univ., Kingston, Ontario (Canada). Centre for Resource Studies). Apr 1982. 82p. NTIS (US Sales Only), PC A05/MF A01. File Number DE85701683.

Federalism, and particularly federal/provincial jurisdictional relationships, have led to considerable uncertainty in the regulation of occupational health and safety and of environmental protection in the Canadian uranium mining industry. The two principal uranium producing provinces in Canada are Saskatchewan and Ontario. Since 1978, in an attempt to avoid constitutional issues, both these provinces and the federal government as well have proceeded unilaterally with health and safety reforms for the industry. In Saskatchewan this has resulted in areas of overlapping jurisdiction, which have led to uncertainty over the legal enforceability of the provincial regulations. In Ontario, the province has left significant gaps in the protection of both workers and the environment. Little progress can be expected in eliminating these gaps and overlaps until the current administrative and jurisdictional arrangements are understood.

38954 **(DOE/SR—3) Confirmatory measurements of special nuclear materials.** Belew, W.L.; Williams, T.L. (USDOE Savannah River Operations Office, Aiken, SC). 1985. 8p. (CONF-850765—11). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014936.

From 26. annual meeting of the Institute of Nuclear Materials Management; Albuquerque, NM, USA (21 Jul 1985).

Confirmatory measurements have been considered to be interim measures until accountability measurements could be performed. When the objectives of the measurements are defined and, measurement techniques selected to attain these objectives, confirmatory type measurements can significantly increase the effectiveness of the safeguards system and in some cases may be preferred to accountability measurements for safeguards purposes. The use of fingerprint type confirmatory measurements can provide highly reliable data to ensure no diversion of SNM has occurred. These measurements can be made quickly to provide rapid assessments of SNM in shipping or storage containers. The use of fingerprint type measurements at SRP on enriched uranium shipments was shown to provide assurance at a high confidence level that no diversion of SNM could have occurred. The objective of the 10 day DOE requirement for accountability measurements is to provide a rapid assessment of SNM quantity for safeguards purposes. In cases where confirmatory or fingerprint measurements have provided assurance that no diversion has occurred, the safeguards system is not compromised by delay of the accountability measurements. The accountability measurements can then be performed for inventory purposes without undue time constraints in a more cost effective and efficient manner. 1 fig.

38955 **(INIS-mf—9673) 1984 Ordinance on nuclear activities (1984:14).** (International Atomic Energy Agency, Vienna (Austria)). 1984. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781417.

Unofficial English translation by the Swedish Nuclear Power Inspectorate.

This Supplementary Ordinance on Nuclear Activities (1984:14) sets out a regulatory regime for the conveyance out of Sweden of equipment or material that has been specially designed or prepared for the processing, use or production of nuclear substances or which is otherwise of essential importance for the production of nuclear devices. The Annex to the Ordinance sets out the list of such equipment or material whose export is subject to Government authorisation.

38956 **(INIS-mf—9717) Mines Safety Control (Radiation Protection) Regulations (Northern Territory) No. 30 of 25 September 1981.** (International Atomic Energy Agency, Vienna (Austria)). 28 Sep 1981. 33p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781499.

These Regulations, pursuant to the Mines Safety Control Act, are intended to prevent or limit the radiation risk to persons involved in the mining or milling of radioactive ores. The duties and responsibilities imposed by the Regulations on owners, managers and employees of the mines are identical with those set forth in the 1980 Code of Practice on Radiation Protection in the Mining and Milling of Radioactive Ores which establishes radiation standards and exposure limits, requires health surveillance of employees and provides for the management of radioactive wastes. (NEA).

38957 **(INIS-mf—9722) Radioactive Ores and Concentrates (Packaging and Transport) Regulations 1980 (Northern Territory) No. 30 of 21 July 1980.** (International Atomic Energy Agency, Vienna (Austria)). 1 Aug 1980. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781507.

These Regulations were issued pursuant to the provisions of the 1980 Radioactive Ores and Concentrates (Packaging and Transport) Act. The primary purpose of the Regulations is to lay down specific record-keeping practices for persons licensed to transport and store radioactive material. (NEA).

38958 **(INIS-mf—9724) Radiation Safety (Transport of Radioactive Substances) Regulations 1982.** (International Atomic Energy Agency, Vienna (Austria)). 24 Dec 1982. 2p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781508.

These Regulations require carriers and consignors of radioactive substances to comply with certain provisions of the 1973 International Atomic Energy Agency Regulations for the Safe Transport of Radioactive Materials and forbid interference with such consignments; amendment is made to the Radioactive Substances Regulations of 1958 by repealing several of its regulations and schedules. (NEA).

38959 **(LA—10350-M) Uranium concentration monitor manual: 2300 system.** Russo, P.A.; Sprinkle, J.K. Jr.; Stephens, M.M. (Los Alamos National Lab., NM (USA)). Apr 1985. Contract W-7405-ENG-36. 102p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE85015359.

This manual describes the design, operation, and procedures for measurement control for the automated uranium concentration monitor on the 2300 solvent extraction system at the Oak Ridge Y-12 Plant. The nonintrusive monitor provides a near-real time readout of uranium concentration at two locations simultaneously in the solvent extraction system for process monitoring and control. Detectors installed at the top of the extraction column and at the bottom of the backwash column acquire spectra of gamma rays from the solvent extraction solutions in the columns. Pulse-height analysis of these spectra gives the concentration of uranium in the organic product of the extraction column and in the aqueous product of the solvent extraction system. The visual readouts of concentrations for process monitoring are updated every 2 min for both detection systems. Simultaneously, the concentration results are shipped to a remote computer that has been installed by Y-12 to demonstrate automatic control of the solvent extraction system based on input of near-real time process operation information. 8 refs., 13 figs., 4 tabs.

38960 **(LA—10373-MS) Assessment of the measurement control program for solution assay instruments at the Los Alamos National Laboratory Plutonium Facility.** Goldman, A.S. (Los Alamos National Lab., NM (USA)). May 1985. Contract W-7405-ENG-36. 44p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015367.

This report documents and reviews the measurement control program (MCP) over a 27-month period for four solution assay instruments (SAIs) Facility. SAI measurement data collected during the period January 1982 through March 1984 were analyzed. The sources of these data included computer listings of measurements emanating from operator entries on computer terminals, logbook entries of measurements transcribed by operators, and computer listings of measurements recorded internally in the instruments. Data were also obtained from control charts that are available as part of the MCP. As a result of our analyses we observed agreement between propagated and historical variances and concluded instruments were functioning properly from a precision aspect. We noticed small, persistent biases indicating slight instrument inaccuracies. We suggest that statistical tests for bias be incorporated in the MCP on a monthly basis and if the instrument bias is significantly greater than zero, the instrument should undergo maintenance. We propose the weekly precision test be replaced by a daily test to provide more timely detection of possible problems. We observed that one instrument showed a trend of increasing bias during the past six months and recommend a randomness test be incorporated to detect trends in a more timely fashion. We detected operator transcription errors during data transmissions and advise direct instrument transmission to the MCP to eliminate these errors. A transmission error rate based on those errors that affected decisions in the MCP was estimated as 1%. 11 refs., 10 figs., 4 tabs.

38961 **(LA—10382-MS) Measurement of enriched uranium and uranium-aluminum fuel materials with the AWCC.** Krick, M.S.; Menlove, H.O.; Zick, J.; Ikonomou, P. (Los Alamos National Lab., NM (USA)). May 1985. Contract W-7405-ENG-36. 26p. (ISPO—219). NTIS, PC A03/MF A01; GPO Dep. File Number DE85015366.

The active well coincidence counter (AWCC) was calibrated at the Chalk River Nuclear Laboratories (CRNL) for the assay of 93%-enriched fuel materials in three categories: (1) uranium-aluminum billets, (2) uranium-aluminum fuel elements, and (3) uranium metal pieces. The AWCC was a standard instrument supplied to the International Atomic Energy Agency under the International Safeguards Project Office Task A.51. Excellent agreement was obtained between the CRNL measurements and previous Los Alamos National Laboratory measurements on similar mockup fuel material.

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Calibration curves were obtained for each sample category. 2 refs., 8 figs., 15 tabs.

38962 (LA-UR—85-1933) Framework for generating expert systems to perform computer security risk analysis. Smith, S.T.; Lim, J.J. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 8p. (CONF-850885—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014134.

From 1. annual AFCEA symposium and exposition on physical and electronic security; Philadelphia, PA, USA (19 Aug 1985).

At Los Alamos we are developing a framework to generate knowledge-based expert systems for performing automated risk analyses upon a subject system. The expert system is a computer program that models experts' knowledge about a topic, including facts, assumptions, insights, and decision rationale. The subject system, defined as the collection of information, procedures, devices, and real property upon which the risk analysis is to be performed, is a member of the class of systems that have three identifying characteristics: a set of desirable assets (or targets), a set of adversaries (or threats) desiring to obtain or to do harm to the assets, and a set of protective mechanisms to safeguard the assets from the adversaries. Risk analysis evaluates both vulnerability to and the impact of successful threats against the targets by determining the overall effectiveness of the subject system safeguards, identifying vulnerabilities in that set of safeguards, and determining cost-effective improvements to the safeguards. As a testbed, we evaluate the inherent vulnerabilities and risks in a system of computer security safeguards. The method considers safeguards protecting four generic targets (physical plant of the computer installation, its hardware, its software, and its documents and displays) against three generic threats (natural hazards, direct human actions requiring the presence of the adversary, and indirect human actions wherein the adversary is not on the premises-perhaps using such access tools as wiretaps, dialup lines, and so forth). Our automated procedure to assess the effectiveness of computer security safeguards differs from traditional risk analysis methods.

38963 (ND-R—1093(R)) Computerised accountancy system for the Irradiated Fuel Cave at PFR at Dounreay. Stansfield, R.G.; Sanderson, S.; Baker, A.R. (UKAEA Risley Nuclear Power Development Establishment). Jun 1984. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781318.

The computerised accountancy system (IFCAS) has been produced for the Irradiated Fuel Cave attached to PFR at Dounreay to supersede an existing paper-based system which was becoming increasingly unworkable with increasing cave throughput. The new system has been implemented as a set of programs written in the COBOL language for one of the 2 DEC-PDP 11/70 computers at Dounreay. The central feature of the new system is the on-line program used by the cave operators to record storage and all operations as they occur. The records of such entities as locations, containers and components are stored on a special type of computer file called a multi-key indexed sequential file. File store management is controlled by the DEC software package for Record Management Services, RMS-11, and the formatted interactive data entry at video terminals is controlled by the DEC software package, Forms Management System, FMS-11.

38964 (RFP—3850) Audit trails in an online accountability system. Jamison, C. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 1985. Contract AC04-76DP03533. 4p. (CONF-850765—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014769.

From 26. annual meeting of the Institute of Nuclear Materials Management; Albuquerque, NM, USA (21 Jul 1985).

The Safeguards Accountability Network (SAN) is an online computer system that was developed by Rockwell International to track the accounting and processing of nuclear materials from the time it arrives at Rocky Flats Plant through its life cycle. A major contributor to the success of SAN is the use of audit trails. They have proven to be invaluable for the management and safeguarding of these sensitive materials at Rocky Flats. Producing effective audit trails requires the recording of all pertinent transactions and the capability to access and report the information in a timely fashion. This paper discusses the implementation and application of these audit trials on the Rocky Flats SAN system. 1 fig.

38965 (SAND—85-0191C) Evaluation of a video storage system for intrusion detections. Chao, B.P. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 8p. (CONF-850996—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013755.

From 29. Human Factors Society annual meeting; Baltimore, MD, USA (30 Sep 1985).

The paper reports an evaluation of a video storage system used in conjunction with closed circuit televisions for surveillance purposes. When multiple intrusions occur simultaneously, video storage permits the user to assess intrusions that might otherwise be missed. A study of specific display characteristics was undertaken to optimize the effectiveness of the video storage system. 4 refs.

38966 (SAND—85-0381C) Interior sensor and environment monitor. Harrington, J.J. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 7p. (CONF-850765—10). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015161.

From 26. annual meeting of the Institute of Nuclear Materials Management; Albuquerque, NM, USA (21 Jul 1985).

This paper describes a special purpose data acquisition system which is used to acquire and record considerable amounts of intrusion sensor and environmental data. The data obtained can be used for planning alarm system installations or for diagnosing a system besieged by false alarms. This system can also be used to determine a sensor's dependency on certain aspects of its environment. The hardware, software, and the operation of this acquisition system will be presented in this paper. 4 figs., 3 tabs.

38967 (SAND—85-0767C) Activities and trends in physical protection modeling with microcomputers. Chapman, L.D.; Harlan, C.P. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 6p. (CONF-850765—6). NTIS, PC A02/MF A01; GPO Dep. File Number TI85015168.

From 26. annual meeting of the Institute of Nuclear Materials Management; Albuquerque, NM, USA (21 Jul 1985).

Sandia National Laboratories developed several models in the mid to late 1970's including the Safeguards Automated Facility Evaluation (SAFE) method, the Estimate of Adversary Sequence Interruption (EASI), the Safeguards Network Analysis Procedure (SNAP), the Brief Adversary Threat Loss Estimator (BATLE), and others. These models were implemented on large computers such as the VAX 11/780 and the CDC machines. With the recent development and widespread use of the IBM PC and other microcomputers, it has become evident that several physical protection models should be made available for use on these microcomputers. currently, there are programs under way to convert the EASI, SNAP and BATLE models to the IBM PC. The input and analysis using the EASI model has been designed to be very user friendly through the utilization of menu driven options. The SNAP modeling technique will be converted to an IBM PC/AT with many enhancements to user friendliness. Graphical assistance for entering the model and reviewing traces of the simulated output are planned. The BATLE model is being converted to the IBM PC while preserving its interactive nature. The current status of these developments are reported in this paper. 6 refs., 2 figs.

38968 (SAND—85-1224C) Statistical evaluation of set-up errors in the ARC/SPAR system. Sheldon, D.D.; McKenzie, J.M. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 5p. (CONF-850765—7). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015145.

From 26. annual meeting of the Institute of Nuclear Materials Management; Albuquerque, NM, USA (21 Jul 1985).

The correlation coefficient, r, between the acoustic return signal and the reference signature of an underwater nuclear safeguard seal, is used to discriminate between intact and broken seals. Ideally, correlation coefficients for intact seals are distributed close to 1.0, while those for broken seals are distributed about 0, with no overlapping of the two distributions. One source of variation that

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affects these distributions and, therefore, the probabilities of making correct decisions with respect to tampering, is the use of different fixtures. Data consisting of 640 digitized amplitudes obtained with each one of ten fixture set-ups were used to investigate the effect of set-up error on correlations for intact seals. These measurements are slow and difficult to make, so "bootstrap" sampling was used to simulate the process. Compared to previous simulations of a single set-up, the standard deviation of the correlation coefficients for intact seals increased almost three-fold, due to variation among set-ups, while the minimum r decreased from .96 to .91. These changes do not significantly increase the probabilities of incorrect decisions. Bootstrapping has proved to be useful where measurements are difficult to obtain. 1 fig.

38969 **(SAND—85-1570C) Results of field and laboratory studies of jam-resistant and voice-private radios.** Heustess, J.E.; Snell, M.K.; Gangel, D.J. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 7p. (CONF-850765—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014841.

From 26. annual meeting of the Institute of Nuclear Materials Management; Albuquerque, NM, USA (21 Jul 1985).

Radio communications systems that use voice privacy or voice scrambling exhibit varying degrees of security range reduction, message intelligibility, and susceptibilities to a jamming assault. Studies included the evaluation of Data Encryption Standard (DES) and Frequency Hopping (FH) systems. Results include voice intelligibility, jamming survivability, and range reduction percentages. 11 figs.

38970 **(SAND—85-1576C) Automated entry control system for nuclear facilities.** Ream, W.K.; Espinoza, J. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 6p. (CONF-850765—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014837.

From 26. annual meeting of the Institute of Nuclear Materials Management; Albuquerque, NM, USA (21 Jul 1985).

An entry control system to automatically control access to nuclear facilities is described. The design uses a centrally located console, integrated into the regular security system, to monitor the computer-controlled passage into and out of sensitive areas. Four types of entry control points are used: an unmanned enclosed portal with metal and SNM detectors for contraband detection with positive personnel identification, a bypass portal for contraband search after a contraband alarm in a regular portal also with positive personnel identification, a single door entry point with positive personnel identification, and a single door entry point with only a magnetic card-type identification. Security force action is required only as a response to an alarm. The integration of the entry control function into the security system computer is also described. The interface between the entry control system and the monitoring security personnel utilizing a color graphics display with touch screen input is emphasized. 2 refs., 7 figs.

38971 **(SAND—85-1670C) New passive helicopter detector.** Elliott, G.R. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 7p. (CONF-850765—9). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015160.

From 26. annual meeting of the Institute of Nuclear Materials Management; Albuquerque, NM, USA (21 Jul 1985).

Sandia has developed a new helicopter detector. The device relies on the correlation between the acoustic wave from the helicopter and the resulting coupled seismic wave. A significant feature of this approach is that the detector is completely passive; there is no radio frequency radiation. Intended for deployment as a perimeter sensor around a site, the unit offers a low nuisance/false alarm rate and a high probability of detection for a wide range of helicopters. Reliable detection occurs when the target is at high altitude and also very near the earth's surface. Detection ranges start at one kilometer for the small, four-place, civilian helicopter and approach five kilometers for heavier, military types. The system has two parts: a transducer package containing a microphone and a geophone and a digital processor. Development is underway for a model which will be AC powered and well suited to permanent facilities. A prototype unit using a lightweight, battery powered processor is being constructed for rapid-deployment applications. 6 figs.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

38972 **(F—82005) Review of tritium licensing requirements.** Meikle, A.B. (Canadian Fusion Fuels Technology Project, Toronto, Ontario). Dec 1982. 23p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701682.

Present Canadian regulations and anticipated changes to these regulations relevant to the utilization of tritium in fusion facilities and in commercial applications have been reviewed. It is concluded that there are no serious licensing obstacles, but there are a number of requirements which must be met. A license will be required from Atomic Energy Control Board if Ontario Hydro tritium is to be applied by other users. A license is required from the Federal Government to export or import tritium. A licensed container will be required for the storage and shipping of tritium. The containers being designed by AECL and Ontario Hydro and which are currently being tested will adequately store and ship all of the Ontario Hydro tritium but are unnecessarily large for the small quantities required by the commercial tritium users. Also, some users may prefer to receive tritium in gaseous form. An additional, smaller container should be considered. The licensing of overseas fusion facilities for the use of tritium is seen as a major undertaking offering opportunities to Canadian Fusion Fuels Technology Project to undertake health, safety and environmental analysis on behalf of these facilities.

0701 Physical Isotope Separation

38973 **(CNEA-NT—16/82) Radioisotopes and radiations program. Contribution to the technological development.** (Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Direccion de Radioisotopos y Radiaciones). 1982. 27p. (In Spanish). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781321.

This program of the National Atomic Energy Commission of Argentina refers to the application and production of radionuclides, their compounds and sealed sources. The applications are carried out in the medical, agricultural, cattle raising and industrial areas and in other engineering branches. The sub-program corresponding to the production of radioactive materials includes the production of radioisotopes and of sealed sources, and an engineering service for radioactive materials production and handling facilities. The sub-program of applications is performed through several groups or laboratories in charge of the biological and technological applications, intensive radiation sources, radiation dosimetry and training of personnel or of potential users of radioactive material. Furthermore, several aspects about technology transfer, technical assistance, manpower training courses and scholarships are analyzed. Finally, some legal aspects about the use of radioisotopes and radiations in Argentina are pointed out.

0702 Radiation Sources

REFER ALSO TO CITATION(S) 38973, 39803, 39859, 40893

38974 (IAEA-TECDOC—321, pp 29-60) **Radiation process control, study and acceptance of dosimetric methods.** Radak, B.B. (Institut za Nuklearne Nauke Boris Kidric, Belgrade (Yugoslavia)). Dec 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781407. (CONF-8311247—).

From Final research co-ordination meeting on high-dose standardization and intercomparison for industrial radiation processing; Munich, F.R. Germany (8 Nov 1983).

The methods of primary dosimetric standardization and the calibration of dosimetric monitors suitable for radiation process control were outlined in the form of a logical pattern in which they are in current use on industrial scale in Yugoslavia. The reliability of the process control of industrial sterilization of medical supplies

for the last four years was discussed. The preparatory works for the intermittent use of electron beams in cable industry were described.

38975 (INIS-mf—9625, pp 14) **Monitoring of chemical ingot covering using radiotracers.** Mayer, J.; Hons, J.; Mrazek, L. (Vyzkumny Ustav Hutnictvi Zeleza, Dobra (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

0703 Isotopic Power Supplies

38976 (DPST—85-133-1) **Pu-238 fuel form activities, January 1-31, 1985.** (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant). Jul 1985. Contract AC09-76SR00001. 10p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014940.

This monthly report summarizes production of $^{238}PuO_2$ fuel forms for use in radioisotopic thermoelectric generators (RTG's) in the Plutonium Fuel Form (PuFF) Facility at the Savannah River Plant.

08 HYDROGEN

0801 Production

38977 (DOE/IR/10103—T1) **Hydrogen from coal via Tin Redox. Energy Related Inventions Program Invention No. 3. Final report.** Erickson, D.C. (Energy Concepts Co., Annapolis, MD (USA)). Feb 1981. Contract FG01-78IR10103. 66p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85014888.

Under sponsorship of the Office of Energy Related Inventions, a new and higher efficiency approach to generating hydrogen from coal has been investigated. The process, referred to as "Tin Redox", involves the reduction of tin oxide to tin by a coal-derived reducing gas, and the subsequent oxidation of the tin by steam to produce hydrogen. The process is similar to one of the oldest hydrogen production methods: the steam-iron process. However, it enjoys the advantage of liquid phase vs solid phase operations, and also provides an important thermodynamic advantage. This feasibility study has confirmed the thermodynamics and provided a laboratory demonstration of the reaction chemistry. A cycling experiment has shown the melt to be capable of continuing alternate oxidation and reduction reactions over long periods without degradation. A computer simulation and economic analysis of a process flowsheet projects 7% energy savings and 13% cost savings compared to a conventional approach to generating hydrogen from coal. Key areas of concern have been analyzed, such as tin loss and corrosion. Possible avenues of further improvement of the process have been indicated. The process is concluded to hold promise sufficient to warrant a more detailed level of investigation. 26 refs.

0805 Safety

REFER ALSO TO CITATION(S) 39348

0806 Industrial And Commercial Use

REFER ALSO TO CITATION(S) 39472

0808 Properties

REFER ALSO TO CITATION(S) 39709

09 OTHER SYNTHETIC AND NATURAL FUELS

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 39712

38978 (DOE/PC/60019—4) **Two-stage process for conversion of synthesis gas to high quality transportation fuels. Quarterly report, April 1-June 30, 1984.** Kuo, J.C.W. (Mobil Research and Development Corp., Paulsboro, NJ (USA)). Aug 1984. Contract AC22-83PC60019. 38p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015200.

This quarter, the sixth run of the two stage bench-scale unit (BSU) was completed and the seventh started. Many of the new features of the pilot plant were successfully tested, and low methane + ethane yields were achieved in both runs. Run CT-256-7 is the first to use an orifice-type feed-gas distributor. The 10.2 cm ID tall hot-flow column was shaken down, while further scoping hydrodynamic studies were performed in our short hot-flow bubble-columns. An improved chromatographic technique was developed for analyzing reactor-wax and some results are reported here. Proprietary wax-upgrading studies are reported in the Mobil Proprietary Appendix. 3 refs., 10 figs., 4 tabs.

38979 (DOE/PC/60019—5) **Two-stage process for conversion of synthesis gas to high quality transportation fuels. Quarterly report, July 1-September 30, 1984.** Kuo, J.C.W. (Mobil Research and Development Corp., Paulsboro, NJ (USA)). Nov 1984. Contract AC22-83PC60019. 55p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85015201.

The seventh run of the two-stage Fischer-Tropsch pilot plant continued during this quarter, thus far accumulating 86 days on stream. Mathematical model calculations on the effects of water-gas shift activity were performed, and a new technique for analyzing heavy reactor-waxes was utilized. Experiments using hot-flow bubble-columns and also our bubble-column reactor have yielded new information on bubble size and gas holdup. We are continuing our investigations into the use of series of continuously stirred tank reactors (CSTRs) as an alternative for bubble-column reactors. 7 refs., 24 figs., 5 tabs.

38980 (DOE/PC/60019—6) **Two-stage process for conversion of synthesis gas to high quality transportation fuels. Quarterly report, 1 October-31 December 1984.** Kuo, J.C.W. (Mobil Research and Development Corp., Paulsboro, NJ (USA)). Feb 1985. Contract AC22-83PC60019. 69p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85015199.

This quarterly report describes the conclusion of the seventh run of the Two-Stage Fischer-Tropsch/ZSM-5 pilot plant, as well as the startup and early operation of the eighth run. The latter run uses Catalyst I-C at moderate pressures and temperatures to produce low methane + ethane yields. Also in this report are results of hydrodynamic studies performed in our 5.1 cm ID hot-flow bubble-column, using a 2 mm single orifice feed-gas distributor. Finally, we discuss some of the results of mathematical model studies of using staged continuously stirred tank reactors (CSTRs) as alternatives to bubble-column reactors. 19 refs., 11 figs., 4 tabs.

38981 (DOE/PC/60805—T7) Cation promotion effects in zeolite-supported F-T catalysts. Seventh quarterly report, March 1985-May 1985. Goodwin, J.G. Jr.; Oukaci, R. (Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering). Jun 1985. Contract FG22-83PC60805. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014770.

An investigation into zeolite-supported F-T catalysts begun under Grant No. DE-FG22-81PC40774 (Office of Fossile Energy, DOE) has produced results which suggest that alkali cations, remaining in a zeolite and serving to neutralize the structure, act to promote higher hydrocarbon formation. It appears that the F-T metal must be highly dispersed throughout the zeolite in the vicinity of these cations for this promotion effect to take palce. This effect is also highly dependent upon alkali cation concentration. The current research involves a study of the promotion effects of the neutralizing alkali cations on CO hydrogenation (under typical F-T conditions) over zeolite-supported Ru catalysts. A new series of ruthenium catalysts was prepared by the conventional ion exchange of Y zeolite containing various alkali cations (Li^+, Na^+, K^+, Rb^+, Cs^+). Prior to reduction with hydrogen, the decomposition of the Ru-hexammine complex was carried out under vacuum using a slow heating rate (0.5 K sec^{-1}) up to 673 K. The samples were characterized by H_2 and CO chemisorption. Much higher and more comparable dispersions were found for most of the catalysts compared to those found after decomposition under flowing helium as discussed in previous reports. Studies of CO hydrogenation at atmospheric pressure and 200 to 300°C have begun using this new series of Ru-zeolite catalysts. 6 refs., 2 tabs.

38982 (DOE/R2/05292—T1) Pilot project to investigate the anaerobic digestion of the European water chestnut. Final report. (Fraser (J.Kenneth) and Associates, Rensselaer, NY (USA)). Dec 1983. Contract FG42-81R205292. 26p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015615.

A pilot project was undertaken by the City of Watervliet, New York, funded by the US Department of Energy, Appropriate Technology Small Grants Program, to verify the feasibility of producing methane gas through the anaerobic digestion of the European Water Chestnut Trapa natans L. Previous laboratory scale experiments confirmed the hypothesis that Trapa natans L. was susceptible to digestion by anaerobic bacteria. The experiment described herein confirmed those results in a "real-world" environment. Furthermore, it was shown that Trapa natans L. could be harvested, held in storage, and digested without employing unusual technologies. Energy for the digestion reaction was obtained from solar radiation, not fossil fuels, limiting the energy-debt to the construction and harvesting aspects of the project. Phase One of this project took place during the months of June through November, 1982. The digester failed to produce gas due to high oxygen levels. It was hypothesized that the buoyancy cells of the uncrushed plants were the source of this oxygen. Phase Two took place during the months of June through September, 1983. At that time, the Trapa natans L. plants were manually crushed and shredded before introduction to the digester. Gas production was 51% methane and 46% carbon dioxide for the second digester run. 9 figs., 1 tab.

38983 (NP—5770321) Effect of feed additives and animal shelter disinfectants on methane fermentation. Hilpert, R. (Muenchen Univ. (Germany, F.R.). Fakultaet fuer Biologie). 16 Mar 1984. 115p. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE85770321.

The first part of the work investigates the effect of potential inhibitors on the entire process of methane fermentation, including more scrupulous testing of some substances as regards the site of their action respectively the groups of organisms concerned. The second part reports on the action of two ionophoric substances, Monensin and Lasalocid, which are commonly used in animal feeding and exhibited interesting effects in the experiments on the total methane fermentation process, on pure cultures of methanogenic bacteria, i.e. on the organisms of the third degradation stage.

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0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 38995

38984 (EGG-M—00185) Startup and operational case histories of the South Point Ethanol and Kentucky Agricultural Energy Corporation fuel ethanol plants. Jones, K.W. (EG and G Idaho, Inc., Idaho Falls (USA)). Jan 1985. Contract AC07-76ID01570. 26p. (CONF-850104—7). NTIS, PC A03/MF A01; GPO Dep. File Number DE85014593.

From 9. annual symposium on energy from biomass and wastes; Lake Buena Vista, FL, USA (28 Jan 1985).

This paper presents the startup and operational case histories with economic assessments of two large alcohol fuel projects: South Point Ethanol at South Point, Ohio, and Kentucky Agricultural Energy Corporation of Franklin, Kentucky. In an effort to expedite fuel ethanol production on a commercial scale, both projects were awarded cost sharing Cooperative Agreement contracts from the Department of Energy and Loan Guarantees from the Farmers Home Administration. These projects represent a 60-million-gallon-per-year fuel ethanol facility, which was constructed by refurbishing a decommissioned ammonia fertilizer complex, and a 21-million-gallon-per-year fuel ethanol facility constructed on a 180-acre farm. These facilities' operation and economic case histories point out major problem areas and pitfalls that should be avoided in future plant construction. This report presents an "as built" description of each facility, the startup and operation case histories, the plant modifications made during startup phase of the project, mass balance, energy efficiency, "as built" capital cost, and operating costs. The appendices present detailed background, scope, and process descriptions for each project. 1 ref., 10 figs., 3 tabs.

38985 (NP—5901843) Transport of methanol by pipeline. (Department of Transportation, Cambridge, MA (USA). Transportation Systems Center). Apr 1985. 106p. NTIS, PC A06/MF A01. File Number DE85901843.

This report examines and evaluates the problems and considerations that could affect the feasibility of transporting methanol by pipeline. The following are the major conclusions: Though technical problems, such as methanol water contamination and materials incompatibility, remain to be solved, none appears insolvable. Methanol appears to be less toxic, and therefore to represent less of a health hazard, than gasoline, the fuel for which methanol is expected to substitute. The primary safety hazards of methanol, fire and explosion, are no worse than those of gasoline. The environmental hazards that can be associated with methanol are not as significant as those of petroleum. Provided quantities of throughput sufficient to justify pipeline transport are available, there appear to be no economic impediments to the transport of methanol by pipeline. Based on these, it appears that it can be concluded that the pipelining of methanol, whether via an existing petroleum pipeline or a new methanol-dedicated pipeline, is indeed feasible. 66 refs., 3 figs., 27 tabs.

38986 Kinetics of cellobiose hydrolysis using cellobiase composites from Trichoderma reesei and Aspergillus niger. Grous, W.; Converse, A.; Grethlein, H.; Lynd, L. (Dartmouth College, Hanover, NH). *Biotechnology and Bioengineering;* **27**: No. 4, 463-470(1985).

The enzymatic hydrolysis of cellulose to glucose involves the formation of cellobiose as an intermediate. It has been found necessary to add cellobiase from Aspergillus niger (NOVO) to the cellobiase component of Trichoderma reesei mutant Rut C-30 (Natick) cellulase enzymes in order to obtain after 48 h complete conversion of the cellobiose formed in the enzymatic hydrolysis of biomass. This study of the cellobiase activity of these two enzyme sources was undertaken as a first step in the formation of a kinetic model for cellulose hydrolysis that can be used in process design. In order to cover the full range of cellobiose concentrations, it was necessary to develop separate kinetic parameters for high- and low-concentration ranges of cellobiose for the enzymes from each organism. Competitive glucose inhibition was observed with the enzymes from both organisms. Substrate inhibition was observed only with the A. niger enzymes.

38987 **Agitation and pressure effects on acetone-butanol fermentation.** Doremus, M.G.; Linden, J.C.; Moreira, A.R. (Colorado State Univ., Fort Collins). *Biotechnology and Bioengineering;* 27: No. 6, 852-860(1985). Contract FG07-81ID12325.

Batch fermentations were run at varying agitation rates and were either pressurized to 1 bar (15.2 psig) or nonpressurized. Agitation and pressure both affect the level of dissolved hydrogen gas in the media, which in turn influences solvent production. In nonpressurized fermentations volumetric productivity of butanol increased as the agitation rate decreased. While agitation had no significant effect on butanol productivity under pressurized conditions, overall butanol productivity was increased over that obtained in the nonpressurized runs. Maximum butyric acid productivity, however, was found to occur earlier and increased as agitation increased. Peak hydrogen productivity occurred simultaneously with peak butyric acid productivity. The proportion of reducing equivalents used in forming the above products was determined using a redox balance based on the fermentation stoichiometry. An inverse relationship between the final concentrations of acetone and acetoin was found in all fermentations studied. The results show that agitation and pressure are important parameters for solvent productivity in acetone-butanol fermentation.

0903 Inorganic Hydrogen Compound Fuels

38988 **(N—85-21397) Use of hydrazine as an alternate source of energy.** Carvalho, J.A. Jr.; Bressan, C.; Ferreira, J.L.G. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). Aug 1984. 12p. (NASA-CR—175535). NTIS, PC A02/MF A01.

The potentials of using hydrazine as an alternative source of energy was studied. Three chemical reactions are considered: oxidation with air, oxidation with hydrogen peroxide, and thermocatalytic decomposition. Performance data of gasoline, ethylic alcohol, and propane are compared. An item about the NO(x) emissions by the various investigated reactions is included. Promising results are shown, mainly those regarding the available energy per unit volume of unburned gases (vaporized fuel and oxidizer).

0904 Solid Waste And Wood Fuels

38989 **(DOE/R8/05031—T1) Solid waste electrical generating feasibility study.** (Wenaas and Associates, Jamestown, ND (USA)). May 1982. Contract FG48-81R805031. 229p. NTIS, PC A11/MF A01; 1; GPO Dep. File Number DE85013397.

The feasibility of recommissioning the existing 3 megawatt steam turbine driven electrical generator of the Municipal Utilities of Valley City, North Dakota, using steam generated in a new facility from the incineration of municipal solid waste generated in the area is examined. It is concluded that (1) there is sufficient municipal solid waste that can be obtained from Valley City, Moorhead and Jamestown (and/or West Fargo) to fuel the plant; (2) the seasonal fluctuation in the amounts of municipal solid waste indicates that a supplementary source of fuel for use during winter would increase plant efficiency; (3) the probable capital cost of the project will be $3,590,000.00; (4) the cost of production of electricity could range from 3.72 cents/kWh to 4.90 cents/kWh, depending on the construction costs, interest rate, lifetime of the project, availability for the plant and steam produced per ton of municipal solid waste; (5) there is no compelling reason why the tertiary cell of the sewage lagoon, cannot be used for cooling water; (6) the State Health Department is ambivalent toward the project; and (7) the public perception of the project is positive. The recommendations include (1) obtain the blessing of the appropriate authorities to proceed to the next steps; (2) obtain letters of intent to commit their municipal solid waste stream to this project from other municipalities; (3) develop a complete and detailed "Request for Proposals" based on demonstrated performance; and (4) explore vigorously the possibilities of grant monies to offset part of the cost. 92 refs., 29 figs., 6 tabs.

38990 **(PB—85-178358/XAB) Fuel models to predict fire behavior in untreated conifer slash. Forest Service research note (final).** Salazar, L.A.; Bevins, C.D. (Forest Service, Berkeley, CA (USA). Pacific Southwest Forest and Range Experiment Station). Nov 1984. 8p. NTIS, PC A02/MF A01.

Fire behavior in untreated slash of nine conifer species was simulated for 10 successive years after logging. Two aging factors that affect fire behavior--fuel bed compaction and foliage retention--were modeled by least squares regression techniques. On the basis of spread rate and flame length for a set of weather observations, standard Northern Forest Fire Laboratory fuel models were chosen to predict fire behavior for aging slash of each species at three initial fuel loadings. Differences in the standard fuel model sequences best representing aging process among species were most influenced by foliage surface-area-to-volume ratio, and such differences increased as initial fuel load increased.

13 HYDRO ENERGY

1301 Resources And Availability

38991 **(TVA/PE/OE—85/28) US-China's cooperation in unified resource development.** Armentrout, D.R. (Tennessee Valley Authority, Knoxville (USA)). 1985. 14p. (CONF-850913—1). NTIS, PC A02/MF A01. File Number DE85901870.

From WATERPOWER '85 - international conference on hydropower; Las Vegas, NV, USA (25 Sep 1985).

This paper reports on activities between China and the United States involving exchange of technical expertise and project development. The paper focuses on how unified resource development principles can be applied to the Hongshui River Basin in China's Guangxi Zhuang Autonomous Region. It reviews discussion and exchanges of the Tennessee Valley Authority, under the US-China Protocol on Cooperation in Hydroelectric Power and Related Water Resources Management, with China's Ministry of Water Resources and Electric Power over a three year period beginning in 1982. At the Waterpower '83 Conference a paper was presented by D.R. Armentrout and R.F. Salisbury on the Chinese visit in 1983 to the Tennessee Valley Region. The purpose of the first seminar was to study the principles of unified resource development and share with the Chinese delegation TVA's practical experience of 50 years of multiple resource development. As part of the seminar, more than thirty papers were prepared and presented by TVA experts on issues relating to land, power, design and construction, water, and economic and industrial development in the Tennessee Valley. These presentations were supplemented with field trips across the Tennessee Valley to show the results of unified development and planning over the past 50 years. The papers were compiled in an unpublished set of seminar proceedings which were given to the members of the delegation.

1306 Environmental Aspects

38992 **(DOE/NBM—5015973) Issue Backgrounder: west of the divide - Fish and Wildlife projects in western Montana.** (USDOE Bonneville Power Administration, Portland, OR; Montana Dept. of Fish, Wildlife and Parks, Kalispell (USA). Fisheries Research and Special Projects Bureau). Jul 1985. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015973.

The report describes fish and wildlife projects funded by the Bonneville Power Administration in Montana. The projects are intended to mitigate impacts on fish and wildlife by hydroelectric power development in the Columbia River Basin. (ACR)

38993 **(TVA/PUB—85/27) Modeling the downstream improvements in dissolved oxygen from aeration of Cherokee and Douglas releases.** Hauser, G.E.; Beard, L.M.; Brown, R.T.; McKinnon, M.K. (Tennessee Valley Authority, Norris (USA). Div. of Air and Water Resources). Sep 1983. 120p. NTIS, PC A06/MF A01. File Number DE85901736.

This report is an evaluation of downstream improvements in dissolved oxygen (DO) which can be anticipated as a result of different levels of aeration at Cherokee and Douglas Dams. The report describes (a) field studies undertaken to describe late summer conditions for model calibration and verification; (b) development and calibration of unsteady flow and water quality models for the tailwater reaches from Cherokee and Douglas Dams to the Holston and French Broad River confluence at the head of Fort Loudoun Reservoir; and (c) model predictions of DO in the tailwater reaches and at their confluence (after mixing) with and without aeration. 7 refs., 47 figs., 4 tabs.

14 SOLAR ENERGY

1403 Economics

REFER ALSO TO CITATION(S) 39017

38994 Photovoltaics industrialization in the world market. Ferber, R.R.; Watts, R.L. (California Inst. of Technology, Pasadena, CA). pp 321-324 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

Photovoltaic power for terrestrial applications, an infant industry, is poised for the rapid growth that can make it a major factor in the world energy supply in the year 2000 and beyond. Today's commercial flat plate and concentrator photovoltaic power modules are based on crystalline silicon cell technology, with several thin film cell technologies now making good progress in the laboratory. One of these thin film technologies, amorphous silicon, has already made major inroads into consumer products markets (calculators, watches, etc.), with Japan having produced more than 3 MW of such products in 1983. The bulk power applications using thin film technologies, however, must await higher cell efficiencies, stable cell development, module development, and long term performance verification.

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 38982, 38984, 38986, 38987, 39416

38995 (ANL/CNSV-TM—157) Energy from biomass: building on a generic technology base. Proceedings of the third technical review meeting. (Argonne National Lab., IL (USA)). Apr 1985. Contract W-31-109-ENG-38. 309p. (CONF-841194—). NTIS, PC A14/MF A01; 1; GPO Dep. File Number DE85014299.

From Southeast industrial biomass energy exposition; Atlanta, GA, USA (28 Nov 1984).

This volume contains the technical papers presented at the review meeting. The meeting's purpose was to spur further expansion of the biomass energy industry by communicating results, capabilities, and needs to researchers, producers of biomass, and users of biomass energy. Significant developments have occurred in the biomass energy field in the past decade, and progress continues as a result of projects funded by the US Department of Energy, other government agencies, and the private sector. The information and experience reported in these meetings will provide a foundation for future growth of the biomass industry. Separate abstracts have been prepared for 30 papers for inclusion in the Energy Data Base.

38996 (BMFT-FB-T—84-290) Research and developmental study on MIS thin film solar cells of amorphus hydrogenated silicon. Pt. 2. Jaeger, H.; Engemann, D.; Ilgenstein, M.; Roessler, W. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 63p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE85752195.

The objective of these investigations was to study the suitability of sputtered hydrogenated amorphous silicon (a-Si:H) layers for thin film solar cells and to improve them for this application. The most important task was to optimise the undoped intrinsic a-Si:H layers with respect to their photovoltaic properties by variation of all parameters that can be affected in our sputtering equipment. Semitransparent Schottky-barrier contacts were used for comparative testing of these layers. Further diode junctions were MIS diodes and several types of n-i-p layer structures. The latter were deposited on both metallic and transparent conductive coated substrates. Toward the end of the study, larger cells of around 2 cm^2 were prepared. Schottky diodes with antireflection layers exhibited an efficiency of eta=1.6% and the following maximum values Vsub(oc)=0.55 V (Au), jsub(sc)=6.8 mA/cm^2. FF=0.54, from which eta'=2% can be calculated. With n-i-p type structures we obtained values up to Vsub(oc)=0.78 V and jsub(sc)=3 mA/cm^2. Here, recombination effects have still to be overcome. Higher values of jsub(sc) can only be achieved by further lowering the density of states of the intrinsic a-Si:H. Layers of n-type and p-type doping were found to have the necessary conductivity even if they had a very low thickness (15 nm).

38997 (CEA-CONF—7201) Cultivation of micro-algae in closed tubular reactor. Gudin, C.; Bernard, A.; Chaumont, D. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France)). Nov 1983. 49p. (In French). (CONF-8311259—1). NTIS (US Sales Only), PC A03/MF A01. File Number DE85752293.

From 2. congress of the French Association for Applied Algology; Saint-Vallier, France (27 Nov 1983).

A description is presented of the three culture pilot utilities in activity under natural light, including glass tubular solar collector (30 mm diameter) in which the microalgae culture circulates. The utility is controled automatically (thermal regulation, gaseous transfers, continuous culture organization). The tests were conducted for the production of polysaccharides (Porphyridium cruentum, chlamydomonas mexicana) or hydrocarbons (Botriococcus braunii).

38998 (CEA-CONF—7348) Microalgae and "in vitro" plant cells for the photosynthetic production of chemical products. Gudin, C.; Chaumont, D.; Bernard, A.; Thepenier, C. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France)). Jan 1984. 10p. (In French). (CONF-840199—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE85752292.

From APRIA colloquium; Paris, France (23 Jan 1984).

The qualitative and quantitative diversity of the metabolites photopolymerized by microalgae leads to the expansion of solar bioindustry; the monoculture of microalgae needs a transparent and closed environment: the reactor is composed of flate plate tubular collectors and carbonation columns. The cost of this type of culture, increased by the costs of metabolite separation and extraction, limits the use of such system to medium- and high added value productions. In that view, the laboratory is presently acting on production of phycocolloids closely related to carraghenans. In order to improve the cost of such system, the utilization of immobilized cells reactors is suggested and developed.

38999 (DOE/ER/10836—T1) Holographic technology for solar energy concentration. Final report and 1983 annual report. Jannson, T. (National Technical Systems, Los Angeles, CA (USA). Research Div.). Jul 1984. Contract AC03-81ER10836. 137p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE85005486.

The objective of 3-year R and D project has been to explore the possibility of using dichromated-gelatin holographic technology for solar energy concentration. Special emphasis has been given to spectrum-splitting holoconcentrators based on the stack of sub-holograms focusing adjusted parts of solar spectrum to various photocells with different band-gaps. Reflection Bragg holograms have been preferred because of low chromatic dispersion and flatter shape of spectral characteristics. During the last year, significant progress has been made in the photochemistry, physics and optics of the holoconcentrators. It was verified that in Lippmann geometry, the reflectivity of the selective holographic mirrors can reach at least 99.9%, i.e., the photochemistry of the dichromated gelatin to a good approximation preserves the physical properties of reflection Bragg holograms. In holoconcentrator geometry, the hologram diffraction efficiency, limited only by Fresnel losses, has been obtained (up to 92%) and it was shown that in the case of zero-disper-

sion gratings with curved holographic coatings, the optical efficiency of the holoconcentrator system can reach this value. Hence, the holoconcentrator systems can be uniquely very close to the ideal PV spectrum-splitting systems. Moreover, several additional attractive holographic applications, such as high-efficiency selective reflective filters, holographic mirrors for long-path multi-gas optical sensors, heat holowindows and laser-protection selective mirrors, have been developed.

39000 **(DOE/JPL—1012-95) Proceedings of the Flat-Plate Solar Array Project Research Forum on the high-speed growth and characterization of crystals for solar cells.** Dumas, K.A. (ed.). (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Apr 1984. Contract AI01-76ET20356. 658p. (CONF-8307129—; JPL-PUB—84-23). NTIS, PC A99/MF A01; 1; GPO Dep. File Number DE84014619.

From Flat-plate solar array project research forum on the high-speed growth and characterization of crystals for solar cells; Port St. Lucie, FL, USA (25 Jul 1983).

Separate abstracts were prepared for 34 papers in this conference proceedings. (LEW)

39001 **(SERI/STR—211-2703) Amorphous silicon photovoltaic devices prepared by chemical and photochemical vapor deposition of higher order silanes. Technical progress report, 1 September 1984-28 February 1985.** Delahoy, A.E.; Ellis, F.B. Jr. (Chronar Corp., Princeton, NJ (USA)). May 1985. Contract AC02-83CH10093. 41p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85012139.

This report describes the preparation of hydrogenated amorphous silicon (a-Si:H) films and photovoltaic devices by chemical vapor deposition (CVD) from higher order silanes, and the properties of such films and devices. The research is directed at exploring new, improved deposition techniques to produce a-Si:H. The improvement could stem from ease of deposition (lower cost and/or better reproducibility), from material improvement (higher efficiency and/or better stability under illumination), or from innovative materials that improve device performance. Research efforts have focused, therefore, on photo-CVD techniques; thermal CVD has been emphasized. This report summarizes the properties of the experimental thermal CVD films and the reasons for terminating the research in this area. In addition, the results for deposition by mercury-sensitized decomposition of disilane are presented. These results indicate that this technique is a very promising alternative to the glow-discharge method.

39002 **(SERI/TP—212-2753) Investigation of defects in GaAsP superlattice structures.** Al-Jassim, M.M.; Jones, K.M. (Solar Energy Research Inst., Golden, CO (USA)). Jun 1985. Contract AC02-83CH10093. 7p. (CONF-8503131—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012134.

From 4. Oxford conference on microscopy of semiconducting materials; Oxford, UK (25 Mar 1985).

GaAsP superlattices have been incorporated in GaAs/GaAsP cascade solar cell structures in an attempt to reduce the dislocation density in the high band gap cell. The structures were grown on GaAs substrates by MOCVD. Defects and irregularities in these structures were investigated by TEM, EBIC, x-ray microanalysis and chemical etching.

39003 **(TVA/ONRED/LER—85/16) Assessment of potential biomass energy impacts on the forest resource of the 201-county Tennessee Valley region.** Barnett, P.E.; Brooks, R.T. Jr.; Curtin, D.T.; McCarthy, D.M.; Ogden, W.H.; Ostermeir, D.M. (Tennessee Valley Authority, Norris (USA). Div. of Land and Economic Resources). Feb 1985. 90p. NTIS, PC A05/MF A01. File Number DE85901751.

Technical Note B53.

This collection of papers describes and analyzes various components of the forest resource in the Tennessee Valley region and discusses potential economic and biological impacts from the fulfillment of projected biomass energy demands. 15 refs., 1 fig., 7 tabs.

39004 **(UCLA—34P278-49) Perturbation effects on the observed deprotonation processes in the photocycle of bacteriorhodopsin.** Dupuis, P.; El-Sayed, M.A. (California Univ., Los Angeles (USA). Dept. of Chemistry and Biochemistry). [1985]. Contract AS03-78ER70278. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015576.

The kinetics of formation of both M_{412} (from its absorption at 405 nm) and the tyrosinate ion (from its absorption at 297 nm) during the photocycle of bacteriorhodopsin are studied simultaneously under different types of perturbation: pH, temperature, high concentrations of salt and deionization. Two formation rates are observed for M_{412}. The slow one is dominant under physiological conditions and is found to be slightly faster than that for the tyrosinate formation. This does not agree with a previous proposal that the tyrosinate formation is a prerequisite to the M_{412} formation. The absorption change at 297 nm is also monitored for the deionized and acidified bacteriorhodopsins (blue membranes). For these samples, only the trans-cis isomerization of retinal is present. The tyrosine deprotonation is not observed. The addition of different salts to the deionized membrane restores the original color and causes a tyrosine deprotonation during the photocycle. A model is proposed to account for the observed deprotonation processes in the photocycle of bacteriorhodopsin. High concentrations of salt do not increase the rates of deprotonation of the protonated Schiff base and tyrosine nor do they increase the relative amplitude of the fast component of the Schiff base deprotonation. This strongly suggests that the observed gain in the quantum yield of proton release per M_{412} formed when the salt concentration is increased is not a result of an increase in these rates. 47 refs., 3 figs.

39005 **Properties and photovoltaic applications of microcrystalline silicon films prepared by RF reactive sputtering.** Moustakas, T.D.; Maruska, H.P.; Friedman, R. (Corporate Research Laboratory, Exxon Research and Engineering Company, Annandale, New Jersey 08801). *Journal of Applied Physics;* **58**: No. 2, 983-986(15 Jul 1985).

Undoped, phosphorus-, and boron-doped microcrystalline silicon films were prepared by RF reactive sputtering, and their properties were investigated through structural, optical, and transport measurements. The merits of microcrystalline films for the p and n contacts in photovoltaic devices were demonstrated through the fabrication of single and tandem p-i-n solar-cell structures with best efficiencies between 5 and 6%.

39006 **Photovoltaic performance measurement: Practice and problems.** Runkle, L.D.; Ross, R.G. (California Inst. of Technology, Pasadena, CA). pp 493-498 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

The function of solar cells, modules and arrays is to produce useful electrical energy. Because photovoltaic conversion efficiency is used to discriminate between competitive photovoltaic technologies as well as between alternate means of producing electrical energy, it is important that the means used to measure the performance of these devices be understood. This paper traces the evolution of photovoltaic performance measurement from its early application in space arrays to its present status in terrestrial applications. Although the discussion is generally addressed to the problem of measuring the power of flat plate modules and arrays, the technology of measuring the characteristics of cells provides the basis for much of the discussion. The problem of developing voluntary consensus performance measurement standards is also discussed and suggestions for enhancing their development are offered.

39007 **Development of a simple field technique for optimizing photovoltaic arrays in residential installations.** Banta, L.E.; Heller, M. (EES/Technology Applications Lab., Georgia Inst. of Tech., Atlanta, GA). pp 503-506 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

Relative placement of photovoltaic (PV) modules within an array affects the overall array efficiency. In research settings, module placement is "optimized" by use of special equipment. A curve tracer is used to determine maximum power current and voltage for each module while a computer program sorts the modules into matched strings. As PV systems become more common in residential applications, the installation will be performed by contractors unable to afford the expensive and delicate equipment. This paper details a simple and inexpensive technique for optimizing PV arrays in a field environment. The mathematical model forming the basis for this technique is presented. A field procedure using a simple test device and a programmable hand-held calculator is outlined. In addition, avenues for further research in this area are suggested.

39008 **Overview of flat-plate photovoltaics technology.** Callagahn, W.T. (California Inst. of Technology, Pasadena, CA). pp 507-510 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

The Flat-Plate Solar Array Project (FSA) is sponsored by the U.S. Department of Energy (DOE) and is managed by the Jet Propulsion Laboratory (JPL), California Institute of Technology. Progress in the technology development of terrestrial flat-plate photovoltaic (PV) modules and information transfer to industry are reviewed over the 10 years of the National PV Program. FSA has been responsible for the development of flat-plate PV modules since the inception of the Program. Recent activities in FSA are also reviewed, with emphasis on tracking flat-plate PV designs for multimegawatt electric utility usage.

39009 **Thin film photovoltaic technology future application potential.** Ferber, R.R. (California Inst. of Technology, Pasadena, CA). pp 511-515 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

Crystalline-silicon photovoltaic technology has existed for nearly 30 years, but only in the last 10 years has an effort been made through a focused Federal R & D program to develop low-cost technology for terrestrial applications. As a part of the low cost R & D effort, a variety of thin-film solar cell options are under intensive development. Thin-film technologies have a particular allure due to their potential for low manufacturing cost through minimal use of expensive semiconductor material and their adaptability to automated manufacture. Multijunction thin-film technologies also have the potential for high module conversion efficiency. This paper discusses the thin-film technologies being researched, the organizations guiding the research and the application potential.

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 38994

39010 **Remote Federal Photovoltaic Utilization Program systems: Design and operation.** Lawson, A.G.; Cochrane, E.H.; Savage, C.H. (California Inst. of Technology, Pasadena, CA). pp 337-341 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

This paper is a partial description of remote and portable photovoltaic systems installed under the Federal Photovoltaic Utilization Program (FPUP). Selected remote and portable photovoltaic systems have already been installed or are being installed by 24 Federal agencies under the sponsorship of the U.S. Department of Energy. These remote and portable FPUP systems are located both within the continental United States and overseas.

39011 **Federal Photovoltaic Utilization Program: Lessons learned and system costing methodology.** Pulscak, M. (US DOE, Washington, DC). pp 343-346 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

This paper describes the Federal Photovoltaic Utilization Program (FPUP) from the viewpoints of its enabling legislation, its objectives, its status, its successes, and its technology transfer program. Funding of $22 million by the U.S. Department of Energy has allowed 26 Federal organizations to participate in FPUP. This will result in the installation of 3164 photovoltaic systems that will generate 600 kWp of photovoltaic electrical power.

39012 **Designing future photovoltaic systems.** Jones, G.J. (Sandia National Lab., Albuquerque, NM). pp 541-546 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

The large scale use of photovoltaic systems to generate our electricity is a dream for the future; but if this dream is to be realized, we must understand these systems today. As a result, there has been extensive research into the design and economic tradeoffs of utility interconnected photovoltaic applications. The understanding gained in this process has shown that photovoltaic system design can be very simple and straightforward endeavor. This paper reviews those past studies and shows how we have reached the present state of system design evolution. The concept of the utility interactive PV system with energy value determined by the utility's avoided cost will be explored. This concept simplifies the screening of potential applications for economic viability, and we will present several "rules-of-thumb" for this purpose.

39013 **Thermal performance of residential photovoltaic arrays.** Wen, L. (California Inst. of Technology, Pasadena, CA). pp 559-564 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

Detailed thermal analyses of a diverse variety of residential photovoltaic (PV) arrays are used to develop a generic understanding of the thermal performance of different array mounting concepts. Eight residential-style buildings, which incorporate four different types of array mounting schemes on their roofs, served as testbeds for this study. Array rear-surface air cooling was determined to be the key design parameter, correlated with the observed operating-temperature differences of the various array types. Design information is presented to allow estimates of operating temperatures of array concepts of interest.

39014 **Operational and performance experience of selected small-and intermediate-sized photovoltaic systems.** Burgess, E.L.; Menicucci, F. (Sandia National Labs., Albuquerque, NM). pp 565-570 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

Operational and performance experiences are summarized for DOE-funded residential and intermediate-sized photovoltaic systems. These systems have operated for up to three years and the lessons learned are being incorporated into new system designs. Over the past several years a number of photovoltaic (PV) systems have been fielded with U.S. Department of Energy (DOE) funds. These systems have been discussed in various previous papers. Considerable experience has now been accumulated with these systems and the purpose of this paper is to summarize some of this experience. The discussion will be limited to small- and intermediate-sized grid-connected systems.

39015 **Federal Photovoltaic Utilization Program: Application and experience.** Lawson, A.C. (California Inst. of Technology, Pasadena, CA). pp 571-576 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

This paper is a partial status report of the Federal Photovoltaic Utilization Program. Selected photovoltaic systems are already installed or being installed by 24 Federal agencies under the sponsorship of the U.S. Department of Energy (DOE). More than 1000 DOE-funded photovoltaic systems are now in operation providing an estimated peak power output of 410 kWp.

1407 Solar Thermal Power Systems

39016 **Solar heat receiver.** Hunt, A.J.; Evans, D.B.; Hansen, L.J. (to Dept.of Energy). US Patent 4,499,893. 19 Feb 1985. Filed date 29 Sep 1982. vp.

PAT-APPL-426370.

A receiver for converting solar energy to heat a gas to temperatures from 700°-900° C is disclosed. The receiver is formed to minimize impingement of radiation on the walls and to provide maximum heating at and near the entry of the gas exit. Also, the receiver is formed to provide controlled movement of the gas to be heated to minimize wall temperatures. The receiver is designed for use with gas containing fine heat absorbing particles, such as carbon particles.

39017 **A comparative economic analysis of a solar-powered/fuel-assisted hybrid Rankine system.** Lior, N.; Koai, K. (Univ. of Pennsylvania, Philadelphia, PA). pp 271-276 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

A present-value life-cycle economic analysis was performed for the SSPRE solar-powered/ fuel-assisted hybrid Rankine system used for cooling. This cycle obtains about 80% of its energy from a solar source at about 100°C, and 20% from a fuel-fired superheater and operates at an efficiency of 15-20%, double from that of comparable all-solar cycles. It was found that the present-value life-cycle cost of solar energy is the predominant cost component, and the economic advantage of this cycle in halving the solar collector area was quantified. The concept of an economic COP$ as proposed by the first author was used to good advantage in this hybrid system. Based on the economic parameter values and method used here, the electrically driven vapor compression chiller delivers at present cooling at about half the cost of the best solar cooling systems.

1408 Ocean Energy Systems

39018 **(SERI/TP—252-2738) Measurements of gas sorption from seawater and the influence of gas release on open-cycle ocean thermal energy conversion (OC-OTEC) system performance.** Penney, T.R.; Althof, J.A. (Solar Energy Research Inst., Golden, CO (USA)). Jun 1985. Contract AC02-83CH10093. 6p. (CONF-850604—12). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012142.

From INTERSOL '85 - Solar energy--the diverse solution; Montreal, Canada (23 Jun 1985).

The technical community has questioned the validity and cost-effectiveness of open-cycle ocean thermal energy conversion (OC-OTEC) systems because of the unknown effect of noncondensable gas on heat exchanger performance and the power needed to run vacuum equipment to remove this gas. To date, studies of seawater gas desorption have not been prototypical for system level analysis. This study gives preliminary gas desorption data on a vertical spout, direct contact evaporator and multiple condenser geometries. Results indicate that dissolved gas can be substantially removed before the seawater enters the heat exchange process, reducing the uncertainty and effect of inert gas on heat exchanger performance.

1409 Solar Thermal Utilization

REFER ALSO TO CITATION(S) 39434, 39435, 39435, 39462

39019 **Operation update and monitoring conclusions of the Georgia Power Company solar system.** Jones, D.H.; Bellamy, G.L.; Ney, E.; Sitz, J. (Heery Energy Consultants, Atlanta, GA). pp 75-80 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

The Corporate Headquarters Office Building of Georgia Power Company (GPC) has one of the largest commercial applications of solar energy for building heating, cooling, and domestic hot water in the U.S. A performance type specification was issued with a guaranteed performance in Btu/yr. A one year operation, maintenance, and monitoring effort was conducted. The 24-story high-rise and the three story low-rise consumes about 50,000 Btu/ft^2-yr (including computer process loads). The solar system will provide about 18.6% of the heating and cooling loads. There are 2203 m^2 of parabolic trough collectors which collect a maximum of one million watts. Conclusions reached during this project include: (1) even with performance type specifications, detailed specifications for integration into building mechanical systems are required, (2) reaction time of the computer control system can inhibit the collector tracking operation, (3) extreme care must be used in a large system design to insure balanced flow, (4) the Delavan tracker can be altered to operate more efficiently, (5) the GPC solar system is providing slightly less than the predicted amount of energy, due to apparently higher than expected parasitic losses, (6) total available direct radiation is less than predicted for the summer months, (7) the electrical hardware on the roof requires more maintenance than expected, (8) the control logic had to be altered to deal with hot hazy days, and (9) there are a number of improvements possible which will make the system more maintenance free and to make use of more reliable state-of-the-art technology.

39020 **An assessment of historical R & M data for SDHW systems.** Jorgensen, G.J. (Solar Energy Research Inst., Golden, CO). pp 111-116 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

This paper consolidates relevant reliability and maintainability (R & M) information based on documented findings from field installations. Data from government sponsored demonstration projects, utilities, private consultants, and owner surveys are included. Failure rates and problem frequencies are emphasized rather than guidelines and experiences, which have been compiled elsewhere. R & M issues concerning solar energy systems, subsystems, and components are reviewed. The information presented is based upon 20 applicable R & M studies. Whenever possible, analogous data from the various studies are compared and combined to give a clearer, more complete representation of pertinent R & M issues.

39021 **System performance evaluation of a prototype solar-assisted heat pump.** McGowan, R.W. (Associates in Rural Development, Inc., Burlington, VT). pp 143-148 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

The thermal performance of a series configured solar-assisted liquid-to-air heat pump was evaluated. The system provided space heating for Solar House III at the Solar Energy Applications Laboratory at Colorado State University. From the experimental data base thus obtained, a component subroutine of the solar energy simulation program TRNSYS was developed. The heat pump and solar system were then simulated in four cities around the U. S. The performance of the dual compressor heat pump in the active solar space heating system was significantly greater than series systems without capacity modulation (multiple or variable speed compressors).

39022 **Component reliability testing.** Farrington, R.B. (Solar Energy Research Inst., Golden, CO). pp 155-160 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

Component and system reliability of active solar energy systems continues to be a major concern of designers, manufacturers, installers, and consumers. Six test loops were constructed at the Solar Energy Research Institute in Golden, Colorado, to thermally cycle active solar energy system components. Drain valves, check valves, air vents, vacuum breakers, tempering valves, and polybutylene pipe were included in the testing. Test results show poor reliability of some of the components and limited performance from others. The results lead to a better understanding of certain failures in the field and present designers with realistic expectations for these components.

39023 **Survey of microcomputer based design tools for building energy calculations.** Ahmed, S.F. (Burt Hill Kosar Rittelman Assoc., Butler, PA). pp 371-375 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

The results of a recently completed survey of microcomputer based buildings energy design tools are presented. Only the design tools developed in the United States have been considered in this survey. The method of categorization of design tools is given. Some areas for further work in the design tool development have been identified.

39024 **Including the effect of control strategy in solar load ratio calculations.** Wray, W.O.; Kosiewicz, C.E. (Los Alamos National Lab., Los Alamos, NM). pp 395-399 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

As originally developed, solar load ratio correlations for performance analysis of passive heating systems were intended for use only with a constant thermostat setpoint. The thermostat setpoint used in the method may be adjusted to account for the effect of heating from internal sources, but setback or shutdown strategies that are frequently employed in both residential and commercial buildings were not allowed. A procedure for approximating the effect of various control strategies through use of an "equivalent constant thermostat setpoint," T /sub ec/ , has recently been developed at the Los Alamos National Laboratory. The value of T /sub ec/ depends on the level and duration of thermostat settings used during the diurnal cycle and on the characteristic time constant of the building. The characteristic time constant is a function of the diurnal heat capacity of the building and its loss characteristics. The method described in this paper has been applied to a variety of passive solar buildings in two distinct climatic regions and was found to yield good accuracy when compared with detailed thermal network calculations.

39025 **Modeling of the DOE-sponsored IPH field-test experiments.** Lewandowski, A. (Solar Energy Research Inst., Golden, CO). pp 313-318 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

The Solar Energy Research Institute (SERI) has modeled seven of the Department of Energy (DOE) sponsored solar Industrial Process Heat (IPH), field test experiments and generated performance predictions for each project. Additionally, these performance predictions have been compared with actual performance measurements taken at the projects. Performance prediction were generated using SOLIPH, an hour-by-hour computer code with the capability for modeling many types of solar IPH components and system configurations. Comparisons of reported and predicted performance resulted in good agreement and a high level of confidence in the ability to accurately estimate potential solar IPH system energy deliveries.

39026 **A modification to the f-chart method for domestic hot water systems with stratified storage.** Copsey, A.B.; Beckman, W.A.; Klein, S.A. (Univ. of Wisconsin, Madison, WI). pp 283-287 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

Several experimental and analytical studies have recently indicated that SDHW performance can be enhanced by operating the collectors at significantly lower flowrates than currently practiced. These studies have shown that system performance can be increased on the order of 10 to 15% by reducing the flow to about 20% of typical collector flowrates. The f-Chart method design tool is not applicable for SDHW systems operating at low flowrates because it was developed with the assumption that the tank is fully mixed (a reasonable assumption when conventional flowrates are used). A modification to the f-Chart method was developed by running numerous TRNSYS simulations employing a stratified tank model. A correlation was developed between collector flowrate and an equivalent area. This equivalent collector area is the collector area that a fully mixed system would need to obtain the same solar fraction on an otherwise identical stratified system. For the range of parameters tested, the modified f-Chart method compares to within 2.0% on an annual basis to simulation results.

1410 Solar Collectors And Concentrators

REFER ALSO TO CITATION(S) 39026

39027 **Field prototype development and system testing of integrated evacuated CPC's.** O'Gallagher, J.; Ford, R.G. (Univ. of Chicago, Fermi Inst., Chicago, IL). pp 185-189 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

The incorporation of a high reflectivity stationary concentrator directly into an evacuated solar collector tube provides dramatically increased high temperature performance and improved lifetime and reliability compared to more conventional evacuated tube designs. An experimental prototype has demonstrated that both of these features are readily achievable. The next phase in the development of this concept is the fabrication of a manufacturable field prototype and its testing in an operating system. Several alternative design configurations for the field prototype and the essential requirements for the system tests are reviewed.

39028 **Point focus dishes with relaxed optical tolerances utilizing non-imaging secondary concentrations.** Winston, R.; O'Gallagher, J.; Ortabasi, U. (Univ. of Chicago, Chicago, IL). pp 191-195 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

A simple model for analyzing the thermal performance of point focus concentrators with non-imaging "ideal" type secondary concentrators is presented. The model relates the efficiency of the concentrator at a given design temperature to the primary slope error tolerances and types of secondary (if any) as a function of the primary focal ratio. It is shown that if the primary alone can achieve an efficiency in the range 0.5 - 0.7, incorporation of a secondary into the basic design can improve the energy delivery by 15% to 20%. Alternatively, one can maintain a fixed efficiency while relaxing the slope error tolerances by 30% to 70%. This is shown to be particularly advantageous for the case of a faceted primary of relatively long focal ratio (F/D s about 1.0).

39029 **Passive stabilization of gradient zone boundaries in solar ponds.** Hull, J.R. (Argonne National Lab., Argonne, IL). pp 259-264 of ASES 1984. Glenn, B.H. Boulder, CO; American Solar Energy Society (1984). (CONF-840622—).

From Annual meeting of the American Solar Energy Society; Anaheim, CA, USA (5 Jun 1984).

The positions of the gradient zone boundaries in the 1080 m^2 Research Salt Gradient Solar Pond at Argonne National Laborato-

ry have been stable for almost three years, even though the thickness of the gradient is larger than that expected by stability arguments of previous studies. The stability is totally the result of passive mechanisms. The lower boundary is continuously maintained by a salt pile at the bottom of the pond, with the top of the pile determining the position of the boundary. The position of the upper boundary cycles over the year. Its yearly average position is maintained by winter ice formation. Stability parameters associated with the upper zone boundary are shown to have a complex hydrodynamics and a large day to day variation.

1420 Heat Storage

39030 (OEFZS—4309) Calculation of freeze safety of water-filled thermal reservoirs in basements under high-altitude Alpine climate conditions. Suda, M.; Hick, H. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Jan 1985. 5p. (In German). (PH—402/85). Special print from HLH, Heizung, Lueft., Klimatech., Haustech. (Dec 1984) v. 35(12) p. 588-591.

With the aid of computer simulation the thermal long-term behaviour of water-filled heat reservoirs was investigated which it is planned to install in the basement of a refuge uninhabited in winter that is situated in the Grossglockner area at some 3.000 m of altitude. Such computations are very useful both to determine the dynamic temperature variation of reservoirs and adjacent rooms and to find out the measures necessary to safeguard the freeze protection of the thermal storage elements. These may consist e.g. in additional thermal insulation of the walls of the storage room or the re-use of waste heat for the thermal storage elements or room. As the paper shows, this kind of calculation provides valuable aids for decisions relating to the construction and dimensioning of thermal storage installations.

15 GEOTHERMAL ENERGY

1501 Resource Status And Assessment

39031 Roosevelt Hot Springs/Hot dry rock prospect and evaluation of the Acord 1-26 well. Shannon, S.S.; Goff, F.; Pettitt, R.A.; Rowley, J.C.; Vuataz, F.D. (Los Alamos National Lab., Los Alamos, NM). pp 541-544 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

Previous hot, dry rock (HDR) geothermal resource evaluation efforts have identified the Roosevelt Hot Springs KGRA as a prime HDR target. The size of the HDR resource is estimated to be at least eight times larger than the adjacent hydrothermal resource. Further research activities to evaluate this HDR resource have involved review of data from the Acord hot dry well, the seismic structure of the area, fluid geochemistry, and hydrology of a shallow aquifer. These recent results are summarized and the most likely HDR prospect area is identified.

1502 Geology And Hydrology Of Geothermal Systems

39032 (USGS-OFR—83-437) Utah: basic data for thermal springs and wells as recorded in GEOTHERM. Bliss, J.D. (Geological Survey, Menlo Park, CA (USA)). May 1983. 385p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901650.

This GEOTHERM sample file contains 643 records for Utah. Records may be present which are duplicates for the same analyses. A record may contain data on location, sample description, analysis type (water, condensate, or gas), collection condition, flow rates, and the chemical and physical properties of the fluid. Stable and radioactive isotopic data are occasionally available. Some records may contain only location and temperature. This compilation should contain all the chemical data for geothermal fluids in Utah available as of December, 1981. 7 refs. (ACR)

39033 Geologic and hydrologic research on the Moana geothermal system - Washoe County, Nevada. Flynn, T.; Ghusn, G. (Univ. of Nevada, Las Vegas, Reno, NV). pp 417-421 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

The Moana geothermal area is the largest single low- to moderate-temperature geothermal resource in the State of Nevada presently employed for direct-use applications. Approximately 150 individual wells, representing a total estimated investment of $5 to $7 million, are presently used to provide heat and hot water to more than 130 private residences, several churches and two large motels. Although most of the wells are constructed to meet the heating needs of individual homes, a large-scale district space heating system, designed to supply heat to 60 houses from a single well, is now being developed. Usable temperatures range from 50° to 99°C (120° to 210°F); well depths range from 60 to 400 m (100 to 1300 ft.). The number of new wells coming on-line in Moana is two to three per month. Development of the resource has been largely unregulated and questions dealing with reported reservoir temperature and water level declines, loss of artesian flow, and fluid disposal have recently surfaced.

39034 A modeling study of the natural state of the Heber geothermal field, California. Lippman, M.J.; Bodvarsson, G.S. (Lawrence Berkeley Lab., Univ. of California, Berkeley, CA). pp 441-446 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

As a first step in simulating the behavior of the Heber field under exploitation, the system is modeled in its natural (pre-exploitation) state. Using Lawrence Berkeley Laboratory's (LBL) computer code PT and a radially symmetric model, a reasonable match between published and calculated temperature and pressure distributions is obtained. The results of the study indicate that the Heber geothermal system is created by the upflow of hot water through a central zone of higher permeability. The model shows that in its natural state the system is recharged at depth by a 15 MW(thermal) convective heat source. The existence of a radially symmetric convection pattern, whose axis coincides with that of the Heber anomaly is suggested. At the lower part of the ascending hot water plume, the deep recharge water mixes with colder water moving laterally towards the axis of the system. On the upper part, the rising plume spreads radially outward before reaching the bottom of the caprock, at 550 m depth. The model results suggest that the caprock is quite permeable, with convection controlling the temperature distribution. The low permeability of the upper zones in the outer region of the system may be due to mineral precipitation.

39035 Structural control of the Baltazor Hot Springs geothermal system, Humboldt County, Nevada. Hulen, J.B. (Univ. of Utah Research Inst., Salt Lake City, UT). pp 156-162 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

The Baltazor Hot Springs KGRA is centered on a low-yield, (4-28 lpm), sodium-sulfate, 7698°C/167-208°F hot spring, surrounded by small opaline sinter mounds and believed to be presently precipitating silica, thus suggesting a deep reservoir temperature of at least 180°C/356°F. The position of the springs, associated calcite-silica stockworks, and presumably a deep thermal reservoir at Baltazor, is clearly controlled by the intersection of a northeasterly-trending Basin and Range fault trough with an older, northwest-trending normal fault system. Of numerous exploration techniques applied at Baltazor, thermal gradient drilling, mapping of geology and alteration, geothermometry, detailed gravity and dipole-dipole resistivity have been most useful in appraising the geothermal resource potential. Baltazor is indicated by these techniques, -- and by probable active silica precipitation -- to remain an encouraging prospect: At least one additional deep drill hole is warranted. The

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target for this hole is a fracture-controlled reservoir in Miocene volcanics and pre-Tertiary metamorphic rocks at depths greater than 2000 ft (610 m) beneath Baltazor Hot Springs.

39036 **Stratigraphy of the Bandelier Tuff and characterization of high-level clay alteration in borehole B-20, Redondo Creek area, Valles Caldera, New Mexico.** Hulen, J.B.; Nielson, D.L. (Univ. of Utah Research Inst., Salt Lake City, UT). pp 163-168 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

Stratigraphy and alteration of borehole Baca20 from the Redondo Creek area in the Valles Caldera have been investigated by binocular microscopic logging and X-ray diffraction techniques. Within the caldera, the Bandelier Tuff has thickened dramatically from documented exposures outside the caldera. The two principal members of the Bandelier, the Otowi and Tshirege, have been recognized in Baca-20. Additional ashflow tuff cooling units have been delineated both below and above the Bandelier. The units above the Bandelier have undergone intense alteration with the formation of a variety of clay minerals, including pure Mg- or Ca-smectite, allevarditeordered illite-smectite, kaolinite and illite. This alteration is apparently controlled largely by high original permeability of these rocks. The presence of the highly ordered illite-smectite suggests that higher temperatures than presently prevail existed during the alteration process.

39037 **Thermal anomaly study for the Otero County area, South Central New Mexico.** Lohse, R.L.; Icerman, L. (New Mexico State Univ. Energy Inst., Las Cruces, NM). pp 175-180 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

Actual temperatures, bottom-hole temperature gradients, and SiO_2 and Na-K-Ca geotemperatures were screened for anomalous data and analyzed for thermal trends and patterns. The western half of the study area is characterized by anomalous data similar to those found to the immediate west in the southern Rio Grande Rift system, while to the east a normal or cool crust is apparent. Major low-temperature geothermal areas exist in the southwestern portion of the study area in the southern end of the Tularosa Basin. Thermal anomaly trends and patterns have a spatial relationship with trends inferred from residual gravity data and mapped surface faults, which suggests fault-controlled hydrothermal systems as the main mechanism responsible for the geothermal anomalies.

39038 **Structural control and alteration at Beowawe KGRA, Nevada.** Sibbett, B.S. (Earth Science Lab., Univ. of Utah, Salt Lake City, UT). pp 187-192 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

The Beowawe geothermal system in northern Nevada is a structurally controlled, water-dominated resource with a measured temperature of 212°C (414°F). Surface expression of the system consists of a large, active opaline sinter terrace that is present along a Tertiary to Quaternary normal fault escarpment. The thermal system appears to be controlled by the subsurface intersection of the east-northeast trending, north dipping Malpais fault with a pre-existing northwest trending fault which dips south and has 884 m of vertical displacement. Surface alteration associated with the geothermal system is vertically zoned along the Malpais escarpment with, from base to top: hematite stained, argillized rock along the fault trace; silicification and quartz veining; and argillic, acid leach zone at the top. Subsurface alteration generally increases with depth in the volcanic rocks and is most intense in basaltic-andesite lava flows which are capped by tuffaceous sedimentary rock.

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39039 **A summary of modeling studies of the Krafla geothermal field, Iceland.** Bodvarsson, G.S.; Eliasson, E.T.; Pruess, K.; Stefanson, V. (Lawrence Berkeley Lab., Berkeley, CA). pp 391-396 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

A comprehensive modeling study of the Krafla geothermal field in Iceland has been carried out. The study consists of four tasks: the analysis of well test data, modeling of the natural state of the field, the determination of the generating capability of the field, and modeling of well performance. The results of all four tasks are consistent with field observations.

1503 Geothermal Exploration And Exploration Technology

REFER ALSO TO CITATION(S) 39031, 39031, 39037, 39054

39040 **A summary of well testing activities at Lawrence Berkeley Laboratory, 1975-1982.** Bodvarsson, M.G.; Benson, S.M. (Univ. of California, Berkeley, CA). pp 397-402 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

This paper presents well test data collected from various geothermal fields by the geothermal group at Lawrence Berkeley Laboratory. The paper describes the type of well tests conducted, the instrumentation used and the data collected. Experience gained through interpretation of the data has helped identify problems in test procedures and interpretative methods.

39041 **A preliminary report on fractured igneous rock environment test pits.** Mathews, M.A.; LaDelfe, C.M.; Scott, J. (Los Alamos National Lab., Los Alamos, NM). pp 519-524 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

Geophysical well logs can now be calibrated for the measurement of physical properties of some igneous and metamorphic lithologies and for the determination of fracture porosity. These geologic conditions are routinely encountered in geothermal reservoirs and geothermal fields. Three large calibration models or test pits were completed on May 1, 1981, at the United States Geological Survey (USGS) Denver Federal Center Calibration Facility. Each calibration model was constructed of large stone blocks that have a cored borehole and wire-sawn simulated fractures. Details of the test pit sizes, simulated fracture locations, rock type of each test pit, and location and access of these pits are discussed herein. Geophysical well logs were obtained from these test pits and these data are shown and discussed.

39042 **Geothermal injection monitoring with d.c. resistivity methods.** Wilt, M.J.; Bodvarsson, G.S.; Goldstein, N.E.; Prueas, K. (Lawrence Berkeley Lab., Berkeley, CA). pp 477-482 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

The authors consider injection into an idealized geothermal reservoir, assuming that the injected water differs in temperature and salinity from in-place fluids. Changes in formation resistivity resulting from temperature and salinity variations are evaluated, and numerical simulation methods are used to predict effects which would be observed by means of dc resistivity monitoring. The resistivity calculations were performed using a three-dimensional computer code to simulate results from two different resistivity arrays, a dipole-dipole array and a downhole-surface array. Our calculations show that the dipole-dipole method is relatively insensitive to

changes due to injection, but downholesurface measurements are very sensitive. From the simulated downhole-surface measurements a bellshaped curve for resistivity change is obtained, from which the position of the chemical front may be approximately determined. Resistivity changes from temperature variations are rather small and probably cannot be detected in field measurements. Resistivity measurements are more than twice as sensitive when injected water is more saline than the in-situ reservoir fluid. This suggests that it may be easier to monitor the location of injected water if geothermal brine is reinjected rather than fresher water.

1504 Legal And Institutional Aspects

39043 Towards solving the conflict between geothermal resource uses. Intemann, P.R. (Oak Ridge National Lab., Oak Ridge, TN). pp 357-360 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

The development of a geothermal resource for energy is often seriously hindered by conflict with the alternative use of the same geothermal resource for recreation. Incompatibility between the development of geothermal energy and the enjoyment of surficial thermal features has constrained development in Japan, New Zealand, Europe, and the United States. Four approaches to the resolution of this problem have been identified. They are 1) research, 2) new technology, 3) design, and 4) marketing.

1505 Economic And Financial Aspects

39044 An evaluation of direct use project drilling costs. Dolenc, M.R.; Allman, D.W.; Childs, F.W.; Sanders, R.D. (EG & G Idaho, Inc., ID). pp 589-593 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

This study evaluates drilling and completion costs from eleven low-to-moderate temperature geothermal projects carried out under the Program Opportunity Notice (PON) and User-Coupled Confirmation Drilling Programs. Projects under both programs are administered by the Department of Energy-Idaho Operations Office. The balance of PON projects were administered by other DOE field offices. Several studies have evaluated geothermal drilling costs, particularly with respect to high temperature system drilling costs. This study evaluates drilling costs and individual cost elements for low-to-moderate temperature projects. It considers the effect of drilling depth, rock types, remoteness of location, rig size, and unique operating and subsurface conditions on the total drilling cost. This detailed evaluation should provide the investor in direct use projects with approximate cost projections by which the economics of such projects can be evaluated.

1506 Environmental Aspects And Waste Disposal

39045 Evaluation of NEPA-based environmental commitments at four geopressured geothermal design wells. Reed, A.W.; Hunsaker, D.B.; Roop, R.D.; Webb, J.W. (Oak Ridge National Lab., Oak Ridge, TN). pp 371-376 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

This study verifies the implementation and effectiveness of environmental mitigation and monitoring commitments made by the U.S. Department of Energy in National Environmental Policy Act documents (Environmental Assessments (EAs)) prepared for four geopressure design well projects, one in Texas and three in Louisiana. The evaluation was based on visits to the project sites conducted by Oak Ridge National Laboratory staff in August 1982 and April 1983, and on a review of monitoring and project activity reports provided by DOE subcontractors. Subcontractors responsible for drilling and testing activities at the well sites adequately implemented most of the mitigation measures described in each project's EA. Exceptions included the lack of impermeable liners for drilling mud pits at three sites and the lack of a ring levee at one site. Water quality, noise, and air monitoring were not performed as strictly as outlined in the EAs. A review of the data collected to date indicates that no significant environmental degradation has occurred. Additional or future monitoring needs, especially with regard to subsidence, microseismicity, and groundwater and soil sampling were recommended.

39046 The direct chlorination process for Hydrogen Sulfide Abatement. Sheinbaum, I.; Sims, A.V. (I. Sheinbaum Co., Inc. Monrovia, CA). pp 58-64 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

The Direct Chlorination Process removes hydrogen sulfide from geothermal off-gases by reacting hydrogen sulfide with chlorine in the gas phase. Hydrogen chloride and elemental sulfur are formed by this reaction. The Direct Chlorination Process has been successfully demonstrated by an on-site operation of a pilot plant at the 3 MWe HPG-A geothermal power plant in Hawaii. Over 99.5 percent hydrogen sulfide removal was achieved in a single cocurrent reaction stage. Chlorine gas did not escape the pilot plant, even when 90 percent excess chlorine gas was used. A preliminary economic evaluation indicates that, when compared with the Stretford Process, the Direct Chlorination Process required about one-third the initial capital investment and about one-fourth the net daily expenditure. Because of the higher cost of chemicals and the restricted markets in Hawaii, the economic viability of this process in Hawaii is questionable.

1508 Geothermal Power Plants

39047 Utah State Prison Geothermal System. Mink, L.R. (Morrison-Knudsen Co., Inc., Boise, ID). *American Association of Petroleum Geologists, Bulletin;* **68**: No. 7, 943(Jul 1984). (CONF-8408161—).

From Energy and More in '84; Salt Lake City, UT, USA (27 Aug 1984).

A geothermal space heating project was recently completed at the Utah State Prison complex at Crystal Hot Springs located near Murray, Utah. The project was initiated in 1978 as a joint U.S. Department of Energy and State of Utah project. Geologic and geophysical investigations initiated in 1979 consist of surface geologic mapping and aeromagnetic and detailed gravity surveys. This exploration program along with several shallow thermal-gradient holes provided the structural details for a subsequent exploration drilling program. The exploration drilling program involved deepening an existing well (SF-1) to 500 ft (150 m) and drilling a new hole (USP/TH-1) to 1000 ft (300 m) to test the extent of the thermal anomaly. Well SF-1 intersected 175]2{F(79]2{C) temperatures in a low permeable quartzite, and well USP/TH-1 intersected highly fractured quartzite in the lower section of the well. A temperature reversal was noted in USP/TH-1 below 700 ft (213 m) with a maximum temperature of 175]2{F(79]2{C) occurring in the zone from 300 to 700 ft (90 to 215 m). Flow testing of USP/TH-1 indicated the well would flow at 1000 gpm with a sustained flow of 400 gpm at a 3.5 psi drawdown over the heating season. Testing also indicated interference with other nearby wells and thermal springs. Fluid production for space heating of the prison facilities took place during the winter of 1983-84. This production will give more data to refine the calculations of reservoir producibility and provide information on the economics of utilizing geothermal fluids for space heating.

1509 Geothermal Engineering

REFER ALSO TO CITATION(S) 39039, 39044

39048 (LBL—16920, pp 31-34) **Test facility to investigate two-phase steam/water flow in porous media.** Verma, A.; Pruess, K.; Bodvarsson, G.S.; Tsang, C.F.; Witherspoon, P.A. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

39049 **(SAND—85-1439C) Rock breakage mechanisms with a PDC cutter.** (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 16p. (CONF-8509117—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015167.

From Annual technical conference and exposition of the Society of Petroleum Engineers; Las Vegas, NV, USA (22 Sep 1985).

Some aspects of chip generation by a polycrystalline diamond compact (PDC) cutter moving through a rock can be understood by examining the shapes of the chips and the fracture patterns in the remaining rock. Data from laboratory experiments have led to general conclusions about the uniformity of chip generation mechanisms in different kinds of rock and about crack nucleation position relative to the cutter tip. 20 refs., 12 figs., 2 tabs.

39050 **A full-scale facility for evaluation of lost circulation materials and techniques.** Loeppke, G.E.; Caskey, B.C. (Sandia National Lab., Albuquerque, NM). pp 449-454 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

Lost circulation is often a problem during well drilling and completion, and can be especially severe in naturally fractured geothermal formations. Sandia National Laboratories has designed and built a full-scale facility for the evaluation of lost circulation materials and techniques under simulated down-hole geothermal wellbore conditions. System capabilities include a maximum temperature of 400°F, maximum allowed working pressure of 1150 psi, and a variable pumping rate up to 280 gpm at 1000 psi. The system will be utilized to evaluate candidate lost circulation materials and techniques that may be useful to solving geothermal well drilling lost circulation problems.

39051 **Lost circulation in geothermal wells: Research and Development status.** Caskey, B.C.; Loeppke, G.E. (Sandia National Lab., Albuquerque, NM). pp 403-407 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

Three of the most common severe problems encountered in drilling and completing geothermal wells are lost circulation, stuck pipe, and inadequate cementing. Since lost circulation may cause or aggravate the other problems, it is considered the single most serious well development problem. Sandia National Laboratories has initiated a multi-faceted program directed at understanding and helping to solve this problem. The program involves characterizing loss zones, developing an analytic fluid dynamics model of zone plugging, screening lost circulation materials in the laboratory and testing some solutions in a large scale test facility. The status and plans for this program are presented.

39052 **Injection testing in 1982 at the Svartsengi high-temperature field in Iceland.** Gudmundsson, J.S. (National Energy Authority, Reykjavik). pp 423-428 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

The Svartsengi reservoir is liquid dominated at 235-240°C and highly fractured. Rapid drawdown of more than 100 m has occurred so reinjection of spent fluids is being considered to maintain reservoir pressure. Cold water was injected into well 12 at Svartsengi for 24 days in 1982. Fluid chemistry was monitored in 6 production wells for about 70 days. Breakthrough indicated by lower sodium concentration (due to dilution of brine by fresh water) and/or changes in gas chemistry was observed after one hour in well 10, after 7 days in well 4, and 34 days in well 9. The average well spacing is 250 m. The test showed that well 12 is not a suitable injection well.

39053 **Drawdown pressure transient analysis of a well near a steam cap.** Sageev, A.; Horns, R.N. (Stanford Univ., Stanford, CA). pp 473-476 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

This paper presents a pressure transient analysis method for a drawdown test in a well near a steam cap. A generalized semilog type curve is presented. Using this type curve and a new semilog type curve matching technique the size of the steam cap and the distance to it may be estimated.

39054 **Microearthquakes induced during hydraulic fracturing at the Fenton Hill HDR site: The 1982 experiments.** Keppler, H.; Albright, J.N.; Pearson, C.F.; Potter, R.M. (Los Alamos National Lab., Los Alamos, NM). pp 429-433 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

The on-site real-time processing of microearthquake signals that occur during massive hydraulic fracturing provides a notion of the location and growth of the fracture system being created. This enables quick decisions to be made in regard to the ongoing operations. We report the analytical results and impact of the hypocenter mapping during the 1982 fracturing experiments in the Fenton Hill Phase II Hot Dry Rock geothermal reservoir.

39055 **Does hydraulic fracturing theory work in jointed rock masses?.** Murphy, H.; Dash, Z.; Keppler, H. (Los Alamos National Lab., Los Alamos, NM). pp 461-466 of Geothermal Resources, Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

The hypocenter locations of micro-earthquakes (acoustic emissions) generated during fracturing typically are distributed three-dimensionally suggesting that fracturing stimulates a volumetric region, rather than the planar fracture theoretically expected. In this paper the hypocenter maps generated at six operating, or potential, HDR reservoirs in the U.S., Europe and Japan are examined in detail and the fracture dimensions are correlated with fracture injection volumes and formation permeability. Despite the volumetric appearance of the maps it is inferred that the induced fractures are mainly planar and may propagate aseismically. The induced seismicity stems from nearby joints which are not opened significantly by fracturing, but are caused to shear-slip because of local pore pressure.

39056 **Hot dry rock geothermal reservoir fracturing initial field operations-1982.** Rowley, J.C.; Dreesen, D.S.; Matsunaga, I.; Nicholson, R.E.; Pettitt, R.A.; Sinclair, A.R. (Los Alamos National Lab., Los Alamos, NM). pp 467-472 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

Initial fracturing operations were conducted during 1982 to create a hot dry rock (HDR) geothermal reservoir at the Los Alamos Fenton Hill site. A preliminary work-over/cleaning operation in November - December 1981 had cleared the injection well,

EE-2, and a detailed, comprehensive plan was prepared to accomplish the objectives of hydraulically connecting the injection and production wells. In January 1982, open-hole reservoir sections of both the production and injection wells were pressurized below the 9-5/8-in. casing. The injection well, EE-2, did not take fluid at 2200 psi, but the production well, EE-3, had a lost circulation zone and took water over a 240 ft zone immediately below the production casing. Subsequent field operations from May through December 14, 1982 involved ten major hydraulic injection and/or equipment tests. These ranged from 14,180 ft (4322 m) deep open-hole packer tests to installation of a cemented-in liner/PBR system. Injections of up to 1.3 x 10 gals. were performed in the injection well. Both wells were fractured in zones just below the production casings. Although several large volume injections were accomplished, hydraulic communication between wells was not achieved. Severe hardware problems were encountered due to temperature limitations, the high fracture gradient (breakdown and injection pressures), and the presence of CO_2 and H_2S during fracture back-flow and well venting. On-line and post-test analyses of seismic monitoring confirmed that fractures were created in each well that converged on, but did not intersect, the neighboring well.

1510 Direct Energy Utilization

39057 **The economic result of geothermal heat for two large greenhouses.** Kunze, J.F.; Gould, R.W.; Wright, R.M. (Energy Services, Inc., Idaho Falls, ID). pp 611-614 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

Two large commercial greenhouses in metropolitan Salt Lake City have been placed on geothermal heat within the last three years. Economic results and comparisons with conventional gas heat show the advantages of geothermal in a very competitive market, where natural gas prices are only 60% of the national average. The 190°F resource proved very attractive, with a simple payback period less than a year. The much deeper, low temperature resource showed the need to squeeze the maximum heat from the water, using economical equipment that would not be suitable for the higher temperatures. The impact of the current tax incentives are discussed.

39058 **Description and operation of Haakon school geothermal heating system.** Childs, F.W.; Kirol, L.D.; McLatchy, M.J.; Sanders, R.D. (EG&G Idaho, Inc., ID). pp 576-584 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

To encourage the development of hydrothermal energy, the U.S. Department of Energy's Division of Geothermal and Hydropower Technologies funded, on a cost-sharing basis, twenty-three demonstration projects. The Haakon School project is one of twelve such projects administered by the DOE-Idaho Operations Office with technical support from EG&G Idaho, Inc. This paper describes the geothermal direct-use heating system at the Haakon School complex in Philip, South Dakota and presents information gained during approximately three heating seasons of operation.

39059 **Geothermal soil heating in Iceland.** Gudmundson, J.S. (Stanford Univ., Stanford, CA). pp 601-606 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

The climate of Iceland is such that only hardy vegetables can be grown in the summer. Common crops are potatoes, carrots, cabbage and cauliflower. Soil heating using geothermal water has been practiced in Iceland for several years. Growing on naturally warm land in geothermal areas has, however, been known for a much longer time. Vegetable growing on warm land has proven to be very attractive and several new systems have recently come into operation. The practice is to heat the soil with low-temperature geothermal water that flows in plastic pipes buried at 50-80 cm depth and spaced 120-200 cm apart. An engineering study was undertaken to quantify the main parameters that govern heat transfer from parallel pipes in soil. Measurements from operational geothermal soil heating systems were compared to model calculations. Design guidelines have been prepared.

1520 Geothermal Data And Theory

REFER ALSO TO CITATION(S) 39032, 39036, 39038

39060 **Continuum model for simultaneous chemical reactions and mass transport in hydrothermal systems.** Lichtner, P.C. (Univ. of California, Berkeley). *Geochimica et Cosmochimica Acta;* 49: No. 3, 779-800(Mar 1985). Contract AS03-83ER13100.

A time-space continuum model for transport of hydrothermal fluids in porous media is presented which provides for simultaneous, reversible and irreversible chemical reactions involving liquids, gases and minerals. Homogeneous and heterogeneous reactions are incorporated in the model in a similar fashion through source/sink terms added to the continuity equation. The model provides for moving reaction fronts through surfaces of discontinuity across which occur jump discontinuities in the various field variables satisfying generalized Rankine-Hugoniot relations. Reversible reactions including aqueous complexing, oxidation-reduction reactions, mineral precipitation and dissolution reactions and adsorption are explicitly accounted for by imposing chemical equilibrium constraints in the form of mass action equations on the transport equations. The transport equations for the primary species combined with homogeneous and heterogeneous equilibria result in a system of coupled, nonlinear algebraic/partial differential equations which completely describe the evolution of the system in time. Spatially separated phase assemblages are accommodated in the model by altering the set of independent variables across surfaces of discontinuity. Constitutive relations for the fluid flux corresponding to primary species are obtained describing transport of both neutral and charged species by advection, dispersion and diffusion. Fluid flow is described by Darcy's law employing a phenomenological expression relating permeability and porosity. Finally an expression for the local retardation factor of solute species is derived for the case of advective transport in a single spatial dimension which accounts for the effects of homogeneous and heterogeneous equilibria including adsorption on the rate of advance of a reaction front. 74 references, 3 figures.

39061 **Values for conductive heat transfer in geothermal technologies.** Intemann, P.R.; Sharp, R.D. (Oak Ridge National Lab., Oak Ridge, TN). pp 491-495 of Geothermal Resources, Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

Thermal conductivity and diffusivity of the subsurface are evaluated as critical parameters in the application of certain geothermal technologies. The variability of these parameters as a function of other subsurface properties is investigated. A simple method of estimating thermal conductivity and diffusivity from available information at specific locations is explained, and an interactive computer program that has been developed to assist in this task is described.

39062 **Time estimates for oxygen isotopic exchange during mineralfluid interaction in hydrothermal systems.** Cole, D.R. (Oak Ridge National Lab., Oak Ridge, TN). pp 283-285 of Geothermal Resources: Energy on Tap. Vol. 7. Hunt, H.H.; Barnette, R.T. Davis, CA; Geothermal Resources Council (1983). (CONF-831041—).

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

Oxygen isotopic shifts observed in hydrothermal ore deposits and geothermal systems have resulted from surface exchange reactions during rock-water interaction at elevated temperatures. Dura-

tions required to produce the observed isotopic shifts in these systems can be modeled from a modified surface exchange rate equation for a sphere: t(sec) = -ln(1-F) (W/R) (a) (p) (X)/3 (1+(W/R) (r) (10^{-4}) where F is the degree of isotopic equilibration between solid and fluid, W/R is the mole ratio of oxygen in water to solid, a is grain radius (cm), p is grain density (gm cc^{-1}), X is the average moles of O gm^{-1} in solid and r is the isotopic rate constant (moles m^{-2} sec^{-1}) for surface exchange reactions. We have assumed that the solid-fluid interactions occurred under conditions of constant temperature and grain size and the fluid flow rates were slow relative to isotopic exchange rates, such that the systems appear static. Times required to produce the isotopic shifts observed in hydrothermal systems are typically less than 200 years. Because the total duration of activity is probably on the order of 10^4-10^6 years, the time estimated by the surface exchange model may represent only a single episode in the lifetime of the system.

17 WIND ENERGY

1706 Wind Energy Engineering

39063 (NP—5770328) Development of a computer controlled wind energy converter for experimental investigations. Mueller, M. (Stuttgart Univ. (Germany, F.R.). Fakultaet 9 - Luft- und Raumfahrttechnik). 22 Jun 1984. 124p. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE85770328.

A computer controlled model of the measurements and functioning of a wind energy converter with horizontal axis was developed in order to develop and check the numerical procedure, which was to be used later in a modified form for outdoor experiments. The rotor hub permits the simulation and testing of design, control and regulation concepts without structural changes. A superimposed control programme determines the type of hub design, where all conceivable variations are possible. The analogue computers tried were absolutely unsuitable because of the complexity and diversity of the control problems, e.g. simulation of a spring, therefore the computer had to take over the direct digital control of the setting members. The supply of the mini-computer in the hub with programmes and experimental parameters was done by a supervisory computer on the ground, using an inductive data transmission system. Parameters from the rotor were transmitted to the ground computer by the same system, which processes data and shows the operating state of the rotor graphically on a screen. The rotor is driven by a hydraulic motor in the laboratory, later on wind will act as generator for the load. The basic suitability of the whole concept for outdoor experiments was proved with the driven rotor, using the example of a swinging hub and a hub with freedom of movement.

39064 (NYSERDA—85-3) New York State Police remote communications site small wind energy conversion system. Final report. (North Wind Power Co., Inc., Moretown, VT (USA)). Mar 1985. 21p. Department of Communications, New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223. File Number TI85901683.

This report concludes a year-long demonstration and study of the use of a North Wind Model HR2 wind energy conversion system to supply the power for a remote New York State Police microwave repeater site at Mt. Morris in the Adirondack Mountains. Data were collected on a multi-channel digital strip chart recorder which provided a printout of the real-time relation between windspeed, power output, battery capacity and voltage, and contribution from backup power. These data proved that the site could be run on wind power alone and predictions can now be made on the performance of an HR2 or similar wind system at other sites. 5 figs., 1 tab.

20 ELECTRIC POWER ENGINEERING

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 38770, 38989, 39409, 39411, 39412, 39413

39065 (CONF-8504159—1) Materials research. Dale, S.J. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 40p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85014653.

From National Research Council workshop on electric energy systems research; Washington, DC, USA (24 Apr 1985).

This presentation on materials will concentrate on dielectric and electrical insulation materials and the directions and needs for research and development. Some examples will also be given on amorphous metals and metal oxide varistor developments which can have significant impact on future equipment designs. Under the existing situation of the limited load growth projections in the utility industry, no single manufacturer of power equipment can justify a broad-based, fundamental and coordinated research program to develop electrical insulation systems to meet the long term needs. The trend is, therefore, towards a weakening of the US compctitive position and the potential for a lack of availability of key products from domestic sources needed by the utility industry.

39066 (DOE/EIA—0095(84)) Inventory of power plants in the United States, 1984. (USDOE Energy Information Administration, Washington, DC. Office of Coal, Nuclear, Electric and Alternate Fuels). Jul 1985. 83p. NTIS, PC A05/MF A01 - GPO; GPO Dep. File Number DE85015557.

Statistical information is presented about electric generating units operated by or planned to be operated by electric utilities in the United States (the 50 States and the District of Columbia). The summarized data contained in this report are useful to a wide audience including Congress, Federal and State agencies, the electric utility industry, and the general public. The data presented in this report were assembled and published by the EIA, US DOE, to fulfill its data collection and dissemination responsibilities as specified in the Federal Energy Administration Act of 1974 (P.L. 93-275) as amended.

39067 (DOE/ET/29101—1) Fabrication, interfacing and testing of a special purpose Power System Simulator. Final report. (Purdue Univ., Lafayette, IN (USA). School of Electrical Engineering). Jun 1985. Contract AC02-78ET29101. 172p. NTIS, PC A08/MF A01; GPO Dep. File Number DE85015381.

The main objective of this project was to extend the present capability of the Power System Simulator to include detailed simulations of station loads in typical fossil, hydro and nuclear power plants. This additional capability will be very useful for many types of investigations, such as (a) establishing representative dynamic models of station loads for transient stability studies, (b) establishing improved models of station synchronous and induction motor loads for restoration studies or load transfer studies, and (c) investigating the control dynamics, interaction and harmonic characteristics of large static inverter drives which are increasingly being used for station variable speed fans and pumps. The program of work has been performed over a two and one-half year period. In the first year, studies were performed to identify the station loads in typical fossil, hydro and nuclear power plants, and to establish the structure and models for these loads. During the remainder of project period, hardware modifications or additions, and software development were performed on the Simulator.

39068 (EPRI-AP—3939-SR, pp 2.1-2.11) Evaluation. Cohn, A.; Elston, C.; Essenhigh, R.S.; Stewart, G. (Electric Power Research Institute, Palo Alto, CA). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

The concept of the direct beneficiated coal-fired gas turbine is that the use of a highly beneficiated coal fuel, in conjunction with major modifications to the gas turbine hot section, would provide for meeting competitive economic and reliability goals. The purpose of the workshop was to get sufficient information for EPRI to formulate a position as to whether or not this concept was realistic. The workshop was intended to address the questions: where does this coal-fired gas turbine development stand with respect to commercialization; what R and D is needed to design a durable turbine; are the prospects for providing a design reasonably attainable; and, what actions, therefore, should be taken? While these questions cannot be answered conclusively without further economic analysis, some credible engineering judgments can be made as to the probable outcome. The general recommendation of the workshop is that overall development intended for commercialization should not be carried out now. However, research and development should be performed on the most critical barrier problem areas and components which would have the most leverage to make the overall development successful.

39069 (EPRI-AP—3939-SR, pp 4.1-4.8) **General Electric Company's participation in the Bureau of Mines Direct Coal-Firing Program (1958-1963).** Schiefer, R.B. (General Electric Co., Schenectady, NY). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

The General Electric Gas Turbine Department was asked to make design modifications to the gas turbine which would reduce the rate of erosion. The most troublesome aspect of the observed erosion was that the rotating blades showed very severe erosion at the root. Efforts were made to minimize this type of erosion by reducing the concentration of fly ash particles at the inner wall and modifying the turbine design to incorporate rotor blade wear strips. To do this, the following changes were made. First, the spacing between the first stator vanes and the rotor blades was increased to allow the centrifugal field to force the ash particles radially outward. Second, the trailing edges of the stator and rotor airfoils were modified to favor forcing the particles outward instead of inward. Finally, the rotor surface was modified to incorporate lowered regions that accommodated the tips of the unshrouded stator vanes. This allowed the insertion of titanium carbide wear strips at the rotor blade roots, at the location where the high velocity clearance space jets impinge against the rotor blade. These changes were incorporated in the turbine, and it was run for about 2000 hours on coal. The results of these tests showed a very significant reduction in the rate of erosion. Based on the observed erosion, it was projected that the blading would require replacement at about 20,000 hours. At the end of the test program, it was thus concluded that the reduction of erosion attributed to the blading design change was significant. Details of the testing are contained in reports by the Bureau of Mines.

39070 (EPRI-AP—3939-SR, pp 5.1-5.52) **Open-cycle coal-burning turbine in Australia (1948 - 1970).** Atkin, M.L. (Aeronautical Research Labs., Melbourne, Australia). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

An investigation into the problems associated with the burning of pulverized coal in an open cycle gas turbine was sponsored by the Australian Government during the period 1948 through 1970. An early survey had indicated that even allowing for the increased capital cost of coal handling and gas cleaning equipment, the system offered advantages in peak load power generation and in industry where process heat was required. At this time, cheap coal was in abundant supply, but very little indigenous liquid fuel was available. Preliminary tests showed that ash particles in the working gases of the open cycle turbine using pulverized brown coal led to severe turbine blade fouling. Later, experiments with a Ruston and Hornsby 1 MW gas turbine converted for coal operation resulted in densely deposited ash on the turbine blades and unexpectedly severe erosion damage. The introduction of gas cleaning reduced the severity of both ash fouling and blade erosion, but blade cleaning procedures were necessary to allow continuous engine operation. These tests showed that the aerodynamic performance of the turbine blading deteriorated significantly with erosion and that the efficient life of the machine would only be of the order of 2500 hours. The high intensity combustor was modified to accept the new fuels, and attention turned to obtaining fine grinding of the harder bituminous coals by mill modification and classification. A combustion efficiency of 98% was achieved. The added residence time in the ash separator aided coal burnout. Ash deposition which caused blade passage blockage with brown coal, due to the nature of the ash, was found to be of minor importance, but blade erosion, caused by the increased solids loading and the more erosive nature of the ash, reduce the blade life to about one quarter of that in the earlier tests, even though the mean size of particles entering the turbines was similar.

39071 (EPRI-AP—3939-SR, pp 6.1-6.38) **Erosion, corrosion, and deposition in coal-fired gas turbines: the experience derived during the past decade.** Stringer, J. (Electric Power Research Institute, Palo Alto, CA). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

The two most detailed studies of using coal directly in a gas turbine were those initiated by the Locomotive Development Committee in the US, and by the Department of Minerals and Energy and the Department of Supply in Australia. The major problems in those two systems were erosion and deposition: corrosion was not identified as a problem, probably because the turbine inlet temperature was relatively low in both cases. More recently, the concept of burning the coal in a pressurized fluidized bed combustor, removing the particles from the hot combustion gas, and expanding it through the gas turbine, has been introduced. There have been several studies of this method; only two have used actual gas turbines. These were the shallow adiabatic bed concept of Combustion Power Corporation and the vertical tube air heater concept of Curtis-Wright. Several studies have expanded the gas through a stationary cascade. Generally, the results are as follows. Deposition is a major problem in the direct combustion systems but is only minor in the PFBC systems. These are normally run so that there is no agglomeration in the bed itself, which implies that the bed temperature is below the initial ash sintering temperature; it is possible for freeboard combustion to produce slightly higher temperatures above the bed, but this should not be a factor in normal operation. However, staged combustion systems to reduce NO/sub x/ emissions may cause more concern. Deposition does occur in PFBC systems, but is normally composed of two parts: a very thin, often glazed layer, particularly on the pressure surfaces; and a very loose, easily removed portion in regions where the gas is relatively stagnant. Hydration of these deposit can occur on cool-down, and cemented accretions may develop; care must be taken to avoid this. The problems experienced with erosion, corrosion, and deposition are discussed.

39072 (EPRI-AP—3939-SR, pp 7.1-7.19) **Corrosion of gas turbine components by coal combustion products.** McCarron, R.L. (General Electric Co., Ballston Spa, NY). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

Currently, low temperature corrosion is being observed on test specimens downstream of the GE Malta Pressurized Fluidized Bed Coal Combustor. The efflux from the PFBC of Na, K, and possibly other contaminants from coal combustion is significant. The primary objective of the studies is to determine the corrosion resistance of candidate gas turbine vane and blade base alloys and protective coating systems in the effluent from a pressurized fluidized bed coal combustor for extended periods of time up to 10,000 hours. It has been estimated that the vapor phase alkali in the combustion products from the PFBC is several orders of magnitude greater than that allowed by the present fuel specification for petroleum fired gas turbines. Test specimens are exposed in the low velocity test section to hot combustion gases at temperatures of 1450-1500°F and velocities of 30 ft/s. The combustor is burning Pittsburgh No. 8 coal with a dolomite sorbent at 1650°F. Corrosion re-

sistance of the various materials is being evaluated at three metal temperatures: 1450-1500°F uncooled, and 1100°F and 1300°F using air-cooled hollow pins. Results of the first 1000-hours of exposure indicate that unprotected nickel and cobalt-based gas turbine blade and vane alloys are susceptible to hot corrosion attack at all three metal temperatures. MCrAlY (M = Fe, Ni, Co) overlay coatings and aluminide diffusion coatings in general show good corrosion resistance at 1500°F but are susceptible to varying degrees of pitting attack at metal temperatures in the range of 1100-1300°F. The corrosion rate data are summarized for all materials being evaluated.

39073 (EPRI-AP—3939-SR, pp 10.1-10.27) **Application of advanced slagging combustor to coal-fired gas turbines.** Bauer, J.M.; Roy, G. (TRW, Redondo Beach, CA). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

The development of an advanced high slag rejection coal combustor is discussed. The generic combustor has a wide variety of potential applications such as industrial and utility boiler retrofit, magnetohydrodynamic power generation, coal gasification, and direct coal-fired gas turbine systems. For gas turbine applications, where the products of coal combustion are to be used directly as the working fluid in high speed rotating machinery, fouling and erosion by ash particles carried over in the stream are problems of major concern. The combustor is a confined vortex flow combustion chamber, which by virtue of its strong cyclonic action not only separates most of the slag from the gaseous stream but also limits the size of the particles carried over. This makes the combustor a strong contender for direct coal-fired gas turbine applications.

39074 (EPRI-AP—3939-SR, pp 11.1-11.7) **Evaluations of utility turbine performance with expansion gases derived from ash bearing fuels.** Wenglarz, R.A. (Westinghouse Research and Development Center, Pittsburgh, PA). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

An EPRI sponsored program concerning utility turbine operation with ash bearing fuels is described. Those results pertinent to direct coal-fired combustion turbines are emphasized. A major objective of the program was to assess utility turbine deposition and corrosion for use of coal-derived liquid and residual oil fuels. A consideration for the program was turbine design effects (e.g., blade surface temperature) on turbine tolerances to expansion gases derived from ash bearing fuels.

39075 (EPRI-AP—3939-SR, pp 13.1-13.5) **Overall system considerations.** Cohn, A. (Electric Power Research Institute, Palo Alto, CA). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

Currently, coal is successfully used as a fuel for gas turbine system power plants by either adding a gasifier with gas cleanup to the system such that the gas is of very high purity or by liquifying the coal and upgrading the product to distillate fuel quality or beyond, such as with methanol. In these systems, therefore, the gas turbine itself needs only to be slightly modified, if at all, but the original coal fuel has been enormously transformed. If less upgraded coal fuels were to be used in a non-modified gas turbine, it could be assuredly predicted that the turbine would run into enormous corrosion, erosion, and deposition problems which would cause very frequent shutdowns, repair, and very uneconomic operation. However, technological advances in recent years in cooling, deposition control, corrosion protection, and coal benefication processes have raised the possibility that a somewhat beneficiated or minimally processed coal fuel may be directly fired in a properly modified gas turbine system. The important and deciding issue will be the overall system economics for the utility dispatch service in which direct coal-fired gas turbine power plants might find an application. The system modifications will add to the capital cost and O and M costs of the (combined-cycle) gas turbine power plant. There will be a trade-off in increased power-plant costs for the expected lower fuel cost of minimally upgraded coal fuel compared to distillate; or from the other end, a trade-off in possibly lower power-plant cost but increased fuel cost compared to burning non-upgraded coal. The overall problem is to find if there is a combination of coal upgrading and hardware modifications that provide for a minimum cost of electricity.

39076 (EPRI-AP—3939-SR, pp 14.1-14.19) **Combustion turbine systems modification for direct coal firing.** Schiefer, R. (General Electric Co., Schenectady, NY). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

Prospects for burning coal in modern heavy-duty gas turbines has received new impetus because of the availability of beneficiated, micronized coal. By using this fuel in the form of a coal-water slurry (CWS), it is believed that combustor performance can approach that of the liquid fuels now in successful use. The specific areas that must be considered are the fuel injection system, the combustor itself, emissions, and the effects of increased ash loading on the combustion system performance. The fuel injection means of fuel nozzle will require some specific features to accommodate the burning of a coal-water slurry. First, the nozzle must be dual fuel with the ability to burn a distillate oil for startup. It must be designed to have CWS passages with low erosion potential. Atomization will need to be done by another medium such as air or steam. The nozzle must deliver the coal particles in a pattern similar to modern gas turbine fuel nozzles so that the CWS flame can have stability approaching that of fuel oil. No modern gas turbine fuel nozzle has these features, and a program to develop such a nozzle will be needed before the other combustor problems can be answered. The program to develop the nozzle is described.

39077 (EPRI-AP—3939-SR, pp 15.1-15.16) **Hot gas cleaning technology for direct coal-fired cycles -- issues and tradeoffs.** Lippert, T.E.; Kearns, D.L.; Ulerich, N.H. (Westinghouse R and D Center, Pittsburgh, PA). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

A brief overall view of hot gas cleaning as it might be related to direct coal-fired gas turbine power generation system is presented. Technical issues are identified that impact overall plant designs, tradeoffs, and economics. These gas cleaning issues are illustrated by comparing related plant cost factors. Hot gas cleaning in this application includes removal of particulate, alkali, and sulfur by utilizing equipment and systems that precede the turbine inlet. Technologies under development for these systems are identified and briefly described.

39078 (EPRI-AP—3939-SR, pp 16.1-16.21) **Erosion considerations for direct coal-fired combustion turbines.** Wenglarz, R.A. (Westinghouse Research and Development Center, Pittsburgh, PA). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

Erosion has been a major deterrence to successful machine performance in past direct coal-fired small turbine experiments. The important considerations that affect erosion for direct coal-fired large utility turbines are discussed. Benefits and approaches for turbine design modifications to increase erosion tolerances are also explored. A majority of the modifications for improved turbine tolerance have minimal effect on turbine efficiency or may even produce somewhat higher efficiencies. However, compensation for these efficiency penalties could be possible due to less turbine performance degradation from erosion, deposition, and corrosion or lower gas cleanup requirements and losses. Although nearly all of the turbine design modifications are indicated to increase turbine cost, the increase might be more than offset by reduced turbine maintenance costs or fuel costs as described earlier.

39079 (EPRI-AP—3939-SR, pp 17.1-17.12) **Effect of hot section surface temperature on corrosion and heavy fuel ash deposits.** Doering, H. (General Electric Co., Schenectady, NY). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

The corrosion behavior of several nickel- and cobalt-base superalloys has been examined in the temperature range 800-1300°F, in an atmosphere of O_2 + 0.15% SO_2, and in the presence of several corrosive deposits containing compounds of Na, V, Pb, and K. Penetration measurements on metallographic cross sections showed that at temperatures above 1050°F the rate of corrosion increased very rapidly. The extent of corrosion was dependent on the composition of the deposit periodically sprayed on the test specimens. The correlation between these laboratory experiments and corrosion penetrations derived from field experience was good. Deposits containing Na, V, and Pb appeared to be equally aggressive to most alloys. Deposits containing K were most aggressive, while those containing Ca and Mg were the least aggressive. In the most aggressive deposits containing K, the average rate of corrosion of many alloys tested increased 30 fold from 1000°F to 1200°F. A test facility consisting of an array of cooled hollow cylinders over which the combustion products were passed, was used in the project to assess the effect of metal temperature on deposit accumulation rates. The results showed that deposit rates increased by a factor of 2, as the surface temperature decreased from 1600°F to 1350°F. In summary, reduced surface temperatures can substantially enhance the turbine's ability to operate with fuels that form corrosive species as well as those that form substantial quantities of ash.

39080 (EPRI-AP—3939-SR, pp 18.1-18.5) **Recent research on the laws governing vapor and particle deposition from combustion gases - implications for diminishing deposition in the direct firing of (beneficiated) coal in combustion turbines.** Rosner, D. (Yale Univ., New Yaven, CT). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

Recent research on vapor deposition (VD) and particle deposition (PD) from combustion gases is reviewed. The emphasis is on relevance to fouling of combustion turbine (CT) blades, but the results and techniques also apply to the fouling of heat exchanger surfaces and the performance of advanced gas-cleaning filters. As will be seen, they also bear directly on hot corrosion and erosion in all of these applications. Recent advances in (a) the development of laws governing deposition by each of the contributing substances (reacting mixtures of condensable vapors, submicron dust, and supermicron rocks), and (b) our understanding of the fate of mineral matter in coal combustion. A discussion of important VD/PD coupling effects, and some implications of this research for direct coal-fired CTs, and research recommendations is presented.

39081 (EPRI-AP—3939-SR, pp 19.1-19.17) **Corrosion and erosion processes relevant to coal-fired gas turbines.** Stringer, J. (Electric Power Research Institute, Palo Alto, CA). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

Some of the mechanistic aspects of erosion and corrosion processes in coal-fired gas turbines is discussed in general terms. At elevated temperatures in oxidizing environments, most common structural metals and alloys will react with the environment to form oxides. Heat-resisting materials depend on the formation of a protective oxide, which forms a continuous adherent layer over the surface of the alloy, grows slowly, and presents a barrier between the elements in the metal and those in the environment. In practice, most heat-resisting materials depend on the formation of chromium oxides, Cr_2O_3, or aluminum oxide, Al_2O_3; a smaller group of materials depend on the formation of silica, SiO_2. The amount of Cr, Al, or Si required in an alloy to develop a protective oxide is sometimes incompatible with other requirements -- for example, having sufficient strength or toughness. In these cases, the surfaces of components can be modified, for example, by enriching them in Cr or Al by diffusion, or by applying a coating of a different, oxidation-resistant, alloy. In this way, systems have been developed for gas turbines, which provide adequate resistance to oxidation.

39082 (EPRI-CS—4014, pp 1.4-1.30) **Heat rate improvement of fossil-fired power plants.** Armor, A.F.; Wong, F.K.L. (Electric Power Research Institute, Palo Alto, CA). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

In recent years, as utilities encounter lower than expected load growth and higher interest rates, new generating units have been deferred until the revival of significant load growth is more certain. The burden of meeting current load demand, therefore, falls on existing generating units. With the rising cost of fuel and new incentive programs from the Public Utility Commissions, utilities continue to improve heat rate performance. The remarkable large margin which separates the most efficient plants (< 9000 Btu/kWH) from the least efficient (> 13,000 Btu/kWH) is a indication that potential for improvement in heat rate still exists. Additional gains to be realized by improving heat rate include reduced plant emissions, increased plant capacity and reduction in plant downtime. In addition, there appears to be a definite relationship between efficiency and availability for fossil plants. In fact, a sudden or gradual reduction in unit efficiency is often symptomatic of incipient component failure. A program of work at the Electric Power Research Institute directed towards improving fossil plant heat rate is described. For example continuous plant performance monitoring and computer assessment of any adverse symptoms is a rapidly advancing area and some utilities have already demonstrated impressive performance gains. Other areas of particular interest include plant testing, plant modeling techniques, equipment efficiency improvements and new plant designs for low heat rate. EPRI has set as its goal in this area the improvement of existing plant heat rate by at least 3% and the improvement of new plant heat rate by 10%.

39083 (EPRI-CS—4014, pp 2.1-2.36) **Guidelines for initiating and improving formal heat rate improvement programs.** Leaver, D.E.; Brown, R.G.; Tome, A.E. (Delian Corp., San Jose, CA). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

Under the sponsorship of the Electric Power Research Institute, Delian Corporation (formerly Wood-Leaver and Associates) is engaged in a project designed to produce guidelines on developing and managing a heat rate improvement program. The primary motivation for the project was the utility need expressed at the August, 1981 Heat Rate Workshop held in Charlotte, North Carolina. At this workshop it was evident that there were a number of utilities interested in initiating (or expanding) heat rate programs in the near future. Since considerable experience already existed among certain utilities which had programs of varying levels in place, it was reasonable to attempt to make the key parts of this experience available in a useful form so the rest of the industry could benefit. The project is intended to do the following: synthesize and condense current industry experience into a usable set of guidelines in report form; emphasize what is being (or can be) successfully done with proven technology on operating plants; and consider the needs of utilities which, because of size, budget or other problems are under severe constraints with regard to resources available for heat rate improvement.

39084 (EPRI-CS—4014, pp 2.37-2.68) **Survey of regulatory agency review of generating unit performance.** Roach, E.M. Jr.; Tarletz, D.B. (Hunton and Williams, Raleigh, NC). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

Regulatory agencies across the country are being called upon increasingly to monitor the management of electric utilities.

Such activity, which once was relatively rare, is now common. Most frequently this oversight centers around the operating performance of generating units, both nuclear and fossil. There are, perhaps, several reasons for this increased interest in the efficient operation of generating units: increased fuel costs and fuel cost differentials, increased lead times and costs for construction of new generating units, and increased dependence on existing units because of construction programs being revised to meet decreased load growth. The monitoring of generating units has taken the form of after the fact evaluation of performance on a case-by-case basis and the implementation of productivity incentive programs. Performance standards are used in these contexts both to measure the adequacy of unit performance and to implement incentives in the form of rewards or penalties. The standard used may be a subjective test of prudent performance or some numerical index of plant performance, e.g., equivalent availability, capacity factor or heat rate. Some of the activity by regulators is reviewed in applying subjective and numerical standards and the considerations involved in applying such standards are discussed.

39085 (EPRI-CS—4014, pp 2.69-2.76) **Performance regulation in Massachusetts.** Sloboda, A.T.; Castro, J. (Boston Edison Co., MA). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

In recent years power plant performance monitoring by state regulatory agencies has become a reality in many states. A prime example of just what is possible has occurred in Massachusetts. Since late 1981, all investor owned utilities in Massachusetts have been collecting fuel adjustment charges through a law that requires a review of generating unit performance. Although there are no rewards for good performance, penalties can be assessed upon a finding of utility mismanagement. The scope of the law that establishes the details of the Massachusetts performance monitoring program is so broad that many changes have been required within Boston Edison including the forecasting of unit performance factors and the establishment of a special group to deal with performance monitoring and the fuel charge. The Massachusetts performance regulation program is discussed.

39086 (EPRI-CS—4014, pp 2.77-2.87) **Achieving reliable and accurate coal sampling and weighing for heat rate determination.** Linton, G.A. (James A. Redding Co., Pittsburgh, PA). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

Information on planning, designing, testing, operating, and maintaining sampling and weighing systems in generating plants is presented. The importance of accurate coal analyses and weights in calculating heat rates is emphasized. However, providing accurate and reliable sampling and weighing systems is difficult and relatively costly. Too often after installation, plant managers are disappointed in the systems not performing satisfactorily. The reasons why these sampling and weighing systems fail to measure up to the required performance are discussed.

39087 (EPRI-CS—4014, pp 2.88-2.105) **Can a small utility afford a heat rate improvement program.** Peffley, R.E. (Board of Water and Light, Lansing, MI). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

The experiences of a small utility in developing a heat rate improvement program (HRIP) are discussed. This request uncovered a lack of a formalized program outlining the specific goal that was anticipated. The Results and Test Group spent a considerable amount of time reviewing the program and the role each of the production departments played in heat rate monitoring. This effort has helped to more clearly define the initial intent and how it was achieved. Although the program is small positive input on how a small utility developed a working HRIP is offered.

39088 (EPRI-CS—4014, pp 2.106-2.124) **Public Service Indiana's turbine performance testing.** Abbott, E.O. (Public Service Indiana, Plainfield). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

Power plant performance is a dynamic and changing condition. The parameters involved in performance can be very difficult to measure, especially on coal fired units. To perform an accurate test on the condition of a unit, large amounts of time and money are usually spent. How Public Service Indiana (PSI) has initiated a low cost performance test program is described and some improvements and modifications that will be implemented in the future are presented. PSI now has modified heat rate testing and performance monitoring programs. The heat rate testing will assist in troubleshooting of equipment, outage planning and scope of work required, fine tuning of the thermal models of the units, a check on plant instrumentation, feedback for the operators on how efficiently they are running the units, and to provide data for the economic dispatch of power. The performance monitoring testing will do just as the name implies, monitor performance. This testing is done by the plant engineers to trend the performance of any of the major pieces of equipment to determine if it has degraded. The heat rate testing program is discussed. How PSI's various groups interact, the equipment involved in the test setup, how the equipment is integrated into a system, a typical test, and future modifications and improvements to the system are covered.

39089 (EPRI-CS—4014, pp 2.125-2.142) **Application of turbine test results to improve performance.** Williams, S.E.; Reuter, R.J. (Potomac Electric Power Co., Washington, DC). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

The Potomac Electric Power Company's generating system is comprised of twelve coal-fired and four oil-fired generating units. Major turbine overhauls are traditionally scheduled based on the manufacturer's recommended interval, system reliability and economy constraints, space and manpower limitations, and existing turbine condition. Generally, major turbine overhauls are performed every six years and require six to ten weeks outage time. Minor turbine valve/boiler inspections are scheduled to comply with state regulations and historical forced outage rate trends. These minor inspections are scheduled every 18 to 22 months and require four weeks outage time. The planning of a major turbine overhaul begins far in advance. This is necessary due to the long lead time required for replacement parts. In the past, the scope of major turbine overhauls was based primarily on inspections performed during the previous major turbine overhaul and, to some degree, during the minor inspections. In recent years, on-line turbine test capability has provided an additional tool in economically planning the workscope and sometimes the timing of major turbine overhauls. Test results identify those turbine components whose condition adversely impacts turbine heat rate. Information of this type was previously unavailable prior to dismantling the turbine, whereupon corrective actions could not be taken due to long lead times required for repair or replacement. This advanced diagnostic capability provides additional lead time for the planning and procurement activities necessary to correct identified turbine deficiencies during the unit's next turbine overhaul.

39090 (EPRI-CS—4014, pp 2.143-2.159) **Motivation for performance: its ups and downs.** Fayssoux, J.O. (Duke Power Co., Pelzer, SC). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

How to get people interested in performing as desired to achieve the appropriate end result is discussed. The people who operate and maintain a power station are the ones who make the performance management program work and keep the unit performing efficiently. Operators who are motivated look for and take action

on items like valves leaking, packing blowing, increased seal water flow, and locating condenser air in leakage to name a few. Operators and engineers who are motivated study on how to improve the system and its operation to improve overall efficiency and lower the cost of operation. Maintenance employees who are motivated look for efficiency problems during equipment teardowns and resolve maintenance related efficiency problems in their daily work. To get these results requires a good Performance Motivation/Management sales program that is not just a one-time sales pitch but rather is one that is on going, continuous, and is viewed by the employees as earnest, and not just for show. How to get a good performance motivation program for a power plant is discussed.

39091 (EPRI-CS—4014, pp 4.2-4.39) **Development and implementation of a heat rate accounting program.** Luksan, D.L. (Consumers Power Co., Jackson, MI). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

The concepts involved in developing and conducting a heat rate accounting program are described. The steps taken by Consumers Power Company to develop and implement a Heat Rate Accounting Program are examined, mechanics of the program are reviewed, and key issues and lessons learned in the process are described.

39092 (EPRI-CS—4014, pp 4.40-4.75) **Turbine performance monitoring methods and instrumentation.** Wescott, J.C. (Power Technologies, Inc., Schenectady, NY). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

Steam turbines are usually an integral part of a system which either generates electrical energy or provides mechanical energy to drive some other piece of equipment. The determination of the performance of these turbines and the subsequent evaluation of changes in performance depend considerably on the design and application. There are two distinct types of steam turbines used in electric power plants. Constant speed turbines which are used to drive electric generators and variable speed turbines used to drive mechanical plant auxiliaries such as boiler feed pumps and forced or induced draft fans. These mechanical drive turbines are considerably smaller than the turbine used to drive generators. There are two classes of turbines used in modern power plants for the generation of electric energy. These usually are differentiated by the source of steam. High pressure, high temperature reheat units are used in conjunction with fossil fired steam generators, while units designed to operate with low pressure steam, with very little superheat or even a slight amount of moisture, are used with light water moderated nuclear reactors. Generally the high pressure units operate at 3600 rpm while the low pressure units operate at 1800 rpm. Methods and instrumentation for monitoring turbine performance are discussed.

39093 (EPRI-CS—4014, pp 4.76-4.92) **Condenser performance awareness, testing, and data evaluation.** Nery, R.A. (R.A. Nery Associates, Abington, MA). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

The method of presentation for this tutorial follows problem solving techniques. Some typical problems are solved to demonstrate a trending methodology of condenser performance.

39094 (EPRI-CS—4014, pp 4.93-4.126) **Effect of heat rate data errors on economic dispatch.** Kafka, R.J. (Potomac Electric Power Co., Washington, DC). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

The effects of heat rate data errors on the economic transmission of electric power are presented in summary form. It was found that data errors on dispatch range units directly affect desired generation level, data errors on fixed load units will have no effect on desired generation (an actual cost), data errors on dispatch range units will cause total production cost errors in the 0.1 to 0.2% range, and data errors on any unit can cause perceived cost errors in the 1 to 2% range.

39095 (EPRI-CS—4014, pp 4.127-4.164) **Diagnosis of turbine problems as determined from monitoring results.** Brandon, R.E. (Power Technologies, Inc., Schenectady, NY). May 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920636. (CONF-8309342—).

From Fossil plant heat rate improvement workshop; St. Louis, MO, USA (20 Sep 1983).

The following data or calculations will be available from turbine monitoring results to the diagnostician: steam pressures and temperatures, steam flow/condensate flow, section efficiency (superheated sections), end packing flow, valve position, kW output, back pressure, vibration level, thrust bearing temperature, and unit performance history. The information of greatest interest will be the most recent periodic measurements and reports enable the diagnositician to determine when serious changes have occurred and whether they were gradual or sudden changes. This will greatly enhance the value of the conclusions and recommendations.

39096 (EPRI-CS—4073-Vol.2) **VERA2D-84: a computer program for two-dimensional analysis of flow, heat, and mass transfer in evaporative cooling towers. Volume 2. User's manual. Final report.** Majumdar, A.K.; Agrawal, N.K.; Keeton, L.W.; Singhal, A.K. (CHAM of North America, Inc., Huntsville, AL (USA)). Jul 1985. 173p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920756.

Cooling towers that do not meet design performance standards can add millions of dollars to the long-term operating costs of generating plants. The VERA2D-84 code offers a reliable method for predicting the performance of natural-draft and mechanical-draft towers on the basis of physical design information.

39097 (EPRI-EA—3619-Vol.3) **Case studies in technology choice. Volume 3. Georgia Power Company. Final report.** Keeney, R.L.; Lathrop, J.W. (Woodward-Clyde Consultants, Walnut Creek, CA (USA)). Jul 1985. 103p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920751.

This report presents Georgia Power Company's technology choice problem: Which technology should the utility use to store energy in off-peak periods for retrieval during peak demand, and where should the facility be located? The analysis compares different technologies and different sites for an energy storage facility capable of generating 2000 MW. The options evaluated included a pair of conventional pumped hydro facilities with reservoirs above ground and three options where one reservoir would be located underground. The conventional facilities would be in the mountains of northern Georgia, while the underground facilities would be at one of two locations in the Piedmont of central Georgia. The analysis, which is based on preliminary data, demonstrates the technology choice model and the insights its use provides.

39098 (EPRI-EL—3775, pp 4.1-4.36) **Vector computer challenge.** Neves, K.W. (Boeing Computer Services Co., Seattle, WA). Nov 1984. Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303 $25.00. File Number TI85920130. (CONF-8010378—).

From Parallel processing for power system planning and operations seminar; Dallas, TX, USA (20 Oct 1980).

The dynamics of modern computation are such that a snapshot of current conditions is quickly obsolete. The cost of scientific software is soaring, while at the same time the relative cost of hardware (i.e., computing horsepower) is decreasing rapidly. The impact on the power industry is a function of how the industry can adapt to high performance hardware trends. Several varieties of high performance hardware exist. For example, large expensive vector computers (e.g., CRAY, CYBER 200's) have been developed to crunch numbers. Another approach is that of providing

array processors as peripherals to smaller computers to enhance their computational power. In this work, the authors concentrate on the potential use of vector computers on power system problems. The basic concepts of vector architectures are reviewed, and specific machine types are described (e.g., CRAY, CYBER 200's, BSP, HEP, AP120B). The mathematical model, the numerical algorithm, and the data organization must function efficiently within the hardware environment. While significant differences can be found among various vector computers, there exists basic principles of vector computation that, if employed, can lead to sound program designs. Examples from the power industry will be used to demonstrate both the pitfalls and potential of vector computers.

39099 (EPRI-EL—3775, pp 8.1-8.12) **Array processor applications in system operation.** Podmore, R. (ESCA Corp., Bellevue, WA). Nov 1984. Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303 $25.00. File Number TI85920130. (CONF-8010378—).

From Parallel processing for power system planning and operations seminar; Dallas, TX, USA (20 Oct 1980).

The advanced energy control systems which have been installed use mainframe computers and perform a wide range of integrated functions for enhancing network security and for optimizing energy production costs in addition to the basic control functions. In the past several years, there have been dramatic decreases in the price of computers which are capable of performing these functions, e.g., midicomputers. In the next few years, major software development efforts will be required by suppliers and utilities to take full advantage of the new midicomputers. In the meantime, it is anticipated that array processors will advance significantly in terms of their capability to handle large scientific and engineering programs and will also be accompanied by compilers which will reduce development costs. In view of this dynamically changing situation, this paper has been written with the following objectives: to review the applications which are important for secure and economic power system operation; to discuss the performance of these applications on state-of-the-art midicomputers; to identify existing applications which could be significantly enhanced and new applications which could be made feasible if the full computing speeds of array processors could be exploited; and to highlight important software issues which will have to be addressed if the potential of array processors is to be realized.

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REFER ALSO TO CITATION(S) 38716, 38751, 38768, 39077, 39602

39100 (DOE/PC/70771—T1) **Kinetics of sulfur and nitrogen reactions in combustion systems. Quarterly report No. 1.** Seeker, W.R.; Chen, S.L.; Cole, J.A.; Greene, S.B.; Kramlich, J.C.; Longwell, J.P.; Sarofim, A.F.; Seiler, E.T.; Wendt, J.O.L. (Energy and Environmental Research Corp., Irvine, CA (USA)). 1985. Contract AC22-84PC70771. 96p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85014943.

The three parts of this report have been entered individually into EDB and ERA. (LTN)

39101 (DOE/PC/70771—T1, pp 2.1-2.30) **Low temperature capture of SO_2 (EER).** 1985. NTIS, PC A05/MF A01. File Number DE85014943.

In Kinetics of sulfur and nitrogen reactions in combustion systems. Quarterly report No. 1.

The objective of the experimental design was to provide an environment in which a gas containing SO_2 could be passed through a fixed bed of sorbent under careully controlled conditions. The percent of calcium that reacted with sulfur (calcium utilization) is shown to increase almost linearly with time. The apparently higher calcium utilization shown for the Warner dolomitic hydroxide could be due to the participation of the magnesium in the reaction at a level consistent with the calcium utilization. The objective of the bench scale experimental design was to provide an environment in which both dispersed phase and bed capture could be evaluated. One advantage of the present system is the filter behaves like the surface of a bag in a baghouse; the surface is continuously accumulating sorbent. This would imply that SO_2 capture by the filter improves with time as the sorbent cake thickens. The inluence of approach to saturation and sorbent type is shown in Figure 10 for dispersed phase capture. Calcium utilizations are relatively poor or dispersed phase capture although they improve at and below the dew point. The influence of dewpoint on total sulfur reduction is shown in Figure 11. The plot indicates a relatively sharp discontinuity between above and below dew point conditions. Above the dewpoint the sorbent attains less than 20% capture. Below the dewpoint captures between 40 and 60% are attained. Finally, Figure 12 shows that influence of calcium/sulfur ratio for total sulfur capture. The results indicate a less than proportional relationship between the ratio and capture. The figure also again shows the strong relationship between capture and temperature relative to dew point. 18 figs., 2 tabs.

39102 (ORNL—6165) **Technical and environmental aspects of electric power transmission.** Kroodsma, R.L.; Van Dyke, J.W. (Oak Ridge National Lab., TN (USA)). May 1985. Contract AC05-84OR21400. 94p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85014981.

Environmental Sciences Division Publication No. 2067.

This document summarizes the salient aspects of power systems and transmission-line technology and the effects of power-line construction and operation on human health and the environment. Major components of power systems are identified from the level of the individual consumer to that of the power pool, including the distribution, subtransmission, transmission, and power pool levels. This is followed by descriptions of the constituent parts and construction of power lines and the operational requirements and features of power lines and systems. Examples of topics include structure and conductor types, design, and selection; switching station and substation design and operation; and transmission line construction and upgrading. Emphasis is on the operational characteristics of transmission lines and of power systems and pools, including conductor and line parameters, insulation, faults, fault protection, electromagnetic field phenomena, corona phenomena, conductor motion, undesirable voltage levels, compensation, system protection, and system stability, reliability, and adequacy. Overhead dc lines, underground lines, and regulations and safety codes pertaining to power lines are briefly discussed. Environmental effects discussed include those stemming from route selection, clearing and construction, power-line operation, right-of-way maintenance, and the physical presence of structures. Examples of specific topics include visual and ecological criteria for route selection; right-of-way acquisition and land-use rights; effects of construction on soils, vegetation, and wildlife; impacts of right-of-way maintenance with herbicides or by cutting; types and use of herbicides; and power-line structure interference with TV reception and bird migration. Finally, the environmental impacts of the construction and operation of ac and dc underground lines are discussed.

39103 (PB—85-175677/XAB) **Bibliography of the Maryland Power Plant Siting Program. Sixth edition.** Magette, T. (Maryland Dept. of Natural Resources, Annapolis (USA). Power Plant Siting Program). Feb 1985. 73p. NTIS, PC A04/MF A01.

See also PB84-175041.

The Maryland Power Plant Siting Act of 1971 established the Power Plant Siting Program to insure that demands for electric power would be met in a timely manner at a reasonable cost while assuring that the associated environmental impact would be acceptable. The scope of the Program extends to estimating the impact of proposed new generating facilities, evaluating the acceptability of proposed transmission line routes, assessing the impact of existing generating facilities, acquiring sites for utilities unable to find a suitable site for generation, and investigating generic issues related to power plant site evaluation and associated environmental and land-use considerations. This bibliography is a compilation of all studies performed for and/or by the Power Plant Siting Program since its inception.

2003 Power Transmission And Distribution

REFER ALSO TO CITATION(S) 39094, 39102, 40323

39104 (EPRI-EA—4120) Radar, electro-optical, and visual methods of studying bird flight near transmission lines. Final report. Gauthreaux, S.A. Jr. (Clemson Univ., SC (USA). Dept. of Biological Sciences). Jun 1985. 70p. Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303. File Number TI85920712.

Concern about the effects of transmission lines on bird mortality and flight patterns has caused utilities construction delays, line rerouting, and permit denials. A new mobile laboratory that combines radar, electro-optical, and video technologies allows researchers to study local and migratory bird behavior near utility and other structures.

39105 (EPRI-EL—3973) Design limits of oil/paper high-voltage direct-current cable. Final report. Arkell, C.A.; Parsons, A.F. (BICC Supertension Cables Ltd., Kent (UK)). Jul 1985. 430p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920762.

Will today's insulation materials be adequate for future transmission lines carrying up to +-1200 kV (more than twice the voltage level now available in pressurized oil systems). Analysis of the constraints on dc cable - from manufacture to operation - show that the oil-impregnated cellulose-paper insulation in use today meets all foreseeable needs.

39106 (EPRI-EL—4147-Vol.1) Utility corridor design: transmission lines, railroads, and pipelines. Volume 1. Engineering analysis and site study. Final report. Frazier, M.J. (Science Applications International Corp., Schaumburg, IL (USA)). Jul 1985. 354p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920763.

A new computer program, CORRIDOR, allows transmission engineers and designers to calculate the voltages and currents induced on railroad and pipeline facilities parallel to a transmission line. This report documents the effects of a proposed 525-kV line on a parallel railroad and pipeline and describes mitigation options.

39107 (EPRI-EL—4150) Backfill materials for underground power cables. Phase 3. Field tests of backfill materials. Final report. Mitchell, J.K. (California Univ., Berkeley (USA). Dept. of Civil Engineering). Jul 1985. 128p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920764.

Additives can improve the ability of the backfill around underground cables to transfer heat and retain moisture, thus reducing the risk of dangerously high cable temperatures. In long-term field tests, treating backfill with slack wax proved to be the most effective method for both improving heat transfer in silty clays and controlling the moisture content of limestone screenings.

39108 (PB—85-183150/XAB) Microcomputer-controlled transformer load monitor. Kearley, S.J.; Hogan, F.J. (Electricity Council Research Centre, Capenhurst (UK)). Dec 1984. 38p. (ECRC/R—1845). NTIS, PC E04/MF E04.

The report describes a microcomputer-based instrument which monitors the current in the three phases of a distribution transformer. The currents are averaged over a thirty-minute period, at the end of which the demand is assigned to one of sixteen bands, and the relevant band is updated. Interrogation of the unit gives a histogram of the transformer loading for a period of up to three years. Several such recorders have been in service during 1982-83 with four Area Boards, and the histograms obtained at various sites are shown. These histograms show that a single maximum demand reading is not a good measure of a transformer's load pattern.

21 NUCLEAR POWER PLANTS

39109 (INIS-mf—9479) Proceedings of the specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions, Balatonaliga, Hungary, 4-6 October 1983. Buerger, L. (ed.). (International Atomic Energy Agency, Vienna (Austria); Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). 1984. 350p. (CONF-8310374—). NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346.

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

Separate abstracts are presented for each of the abstracts included in the data base.

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 38848, 39199, 39201, 39202, 39205, 39241, 39243, 39255, 39256, 39257, 39297, 39299, 39302, 39319, 39343, 39346, 39348, 39349, 39350, 39356, 39366, 39501

39110 (CONF-850902—2) Analysis of the effects of corrosion potential and impurities on the stress corrosion cracking of Type 304 stainless steel. Maiya, P.S.; Kassner, T.F.; Ruther, W.E. (Argonne National Lab., IL (USA)). Jun 1985. Contract W-31-109-ENG-38. 17p. NTIS, PC A02/MF A01 - GPO. File Number TI85014964.

From 2. international symposium on environmental degradation of materials in nuclear power systems--water reactors; Monterey, CA, USA (9 Sep 1985).

Intergranular stress corrosion cracking (IGSCC) of sensitized Type 304 stainless steel (SS) has been a recurrent problem in the high-temperature water environment of boiling-water-reactors (BWRs) over the past two decades. The synergistic effects of environmental and material variables on stress corrosion cracking (SCC) of Type 304 SS were investigated at 289°C by means of constant-extension-rate-tensile (CERT) tests at a strain rate of 1 x 10^{-6}/s. Correlations among environmental variables (dissolved oxygen and impurity concentrations, viz., H_2SO_4, steady-state open-circuit electro-chemical potential) and the SCC susceptibility parameters have been determined. The extensive results over a wide range of open-circuit corrosion potential conditions were analyzed by a model which accounts for the effects of environmental variables, microstructure (e.g., degree of sensitization) and strain rate. The results are consistent with a slip-dissolution mechanism for SCC. Furthermore, representation of the dependence of corrosion potential and average crack growth rate on the dissolved oxygen concentration of the water by a simple mathematical function, in conjunction with the theoretical model, enables predictions of both strain rate and environmental effects on the SCC susceptibility of sensitized Type 304 SS. 12 refs., 7 figs.

39111 (EPRI-NP—4134) Monitoring of chemical contaminants in BWRs. Final report. Dillman, B.H.; Elliott, J.C.; Head, R.A.; Osterle, J.E.; Tunder, R.S. (General Electric Co., San Jose, CA (USA)). Jul 1985. 132p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920747.

Off standard water quality in BWRs has been a recurrent problem due to a number of causes such as: (1) main condenser inleakage; (2) performance of the reactor water cleanup and condensate demineralizer systems; (3) leakage or intrusion of ion exchange resins from these systems; and (4) intrusion of various chemical contaminants into radwaste. Intrusion of chemical contaminants includes such organic substances as lubricating oils, cleaning solvents, and refrigerant materials. These organics, being non-ionic, are not removed by the radwaste demineralizers and eventually enter the primary coolant by way of the condensate storage tank. Once in the primary coolant, the organics decompose under the influence of heat and radiation to produce hydrogen halides, organic acids, or other products, resulting in high reactor water conductivity and low pH. These effects can cause corrosive attack on various com-

ponents in the system. The objectives of this EPRI program are: (1) to identify chemical contaminants that could potentially enter the BWR water systems; (2) to determine the potential impact of intrusion on the BWR; (3) to identify means to prevent or mitigate an intrusion; (4) to identify methods for organic cleanup following a spill; and (5) to establish requirements and identify methods of monitoring organics following an intrusion. 31 refs., 11 figs., 14 tabs.

39112 (EPRI-NP—4139-SR) BWR shutdown analyzer using artificial intelligence techniques. Cain, D.G. (Electric Power Research Inst., Palo Alto, CA (USA)). Jul 1985. 111p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920750.

A prototype alarm system for detecting abnormal reactor shutdowns based on artificial intelligence technology is described. The system incorporates knowledge about Boiling Water Reactor (BWR) plant design and component behavior, as well as knowledge required to distinguish normal, abnormal and ATWS accident conditions. The system was developed using a software tool environment for creating knowledge-based applications on a LISP machine. To facilitate prototype implementation and evaluation, a causal simulation of BWR shutdown sequences was developed and interfaced with the alarm system. An intelligent graphics interface for execution and control is described. System performance considerations and general observations relating to artificial intelligence application to nuclear power plant problems are provided.

39113 (INIS-mf—9629) Annual report 1983 of GKN. (Gemeenschappelijke Kernenergiecentrale Nederland N.V., Arnhem). 29 Mar 1984. 35p. (In Dutch). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781347.

In this annual report of the N.V. Gemeenschappelijke Kerncentrale Nederland, the balance of expenses and profits of the Dodewaard reactor is presented. It also offers an account of management and maintenance of the reactor. Especially, a problem with the cooling system is reported, viz. the attachment of mussels in the cooling system. Moreover, the modification of the feedwater in-let of the reactor vessel is discussed.

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 38858, 39197, 39206, 39241, 39242, 39254, 39255, 39256, 39261, 39264, 39266, 39267, 39268, 39269, 39271, 39272, 39273, 39274, 39275, 39276, 39285, 39287, 39288, 39289, 39290, 39291, 39297, 39298, 39299, 39300, 39303, 39312, 39314, 39315, 39317, 39318, 39321, 39322, 39324, 39325, 39327, 39341, 39345, 39346, 39347, 39354, 39356, 39361, 39362, 39366, 39367, 39368, 39369, 39504, 39596

39114 (CONF-850679—2) Application of probabilistic fracture mechanics to the PTS issue. Cheverton, R.D.; Ball, D.G. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 33p. NTIS, PC A03/MF A01 - GPO. File Number TI85014654.

From 18. American Society for Testing and Materials symposium; Boulder, CO, USA (1 Jun 1985).

As a part of the NRC effort to obtain a resolution to the PWR PTS issue, a probabilistic approach has been applied that includes a probabilistic fracture-mechanics (PFM) analysis. The PFM analysis is performed with OCA-P, a computer code that performs thermal, stress and fracture-mechanics analyses and estimates the conditional probability of vessel failure, P(F/E), using Monte Carlo techniques. The stress intensity factor (K/sub I/) is calculated for two- and three-dimensional surface flaws using superposition techniques and influence coefficients. Importance-sampling techniques are used, as necessary, to limit to a reasonable value the number of vessels actually calculated. Analyses of three PWR plants indicate that (1) the critical initial flaw depth is very small (5 to 15 mm), (2) the benefit of warm prestressing and the role of crack arrest are transient dependent, (3) crack arrest does not occur for the dominant transients, and (4) the single largest uncertainty in the overall probabilistic analysis is the number of surface flaws per vessel. 30 refs., 6 figs., 4 tabs.

39115 (CONF-851115—9) Correlations between calculated surveillance dosimeter activities and pressure vessel fluxes in the Arkansas Nuclear One-Unit 1 Reactor. Maerker, R.E.; Broadhead, B.L. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014652.

From American Nuclear Society winter meeting; San Francisco, CA, USA (10 Nov 1985).

An illustration of the magnitudes of the cross-correlations between cavity dosimetry and fluxes at an important location in the pressure vessel is given for the case of the ANO-1 reactor and provides a correspondence with previously reported flux covariance reduction factors. These correlations are seen to extend over energy regions far wider than would be intuitively expected because of the highly correlated nature of the calculated pressure vessel fluxes themselves, thus enhancing the range of pressure vessel flux information that is provided by the dosimetry. Finally, the high degree of correlation between the cavity dosimeters and pressure vessel fluxes shows that ex-vessel dosimetry can be successfully applied to reactor pressure vessel damage surveillance programs.

39116 (DOE/ET/34019—5) Development of a reactor coolant pump monitoring and diagnostic system. Topical report: system development and installation, July 1980-May 1984. Morris, D.J. (Babcock and Wilcox Co., Lynchburg, VA (USA). Nuclear Power Div.). Mar 1985. Contract AC02-79ET34019. 103p. (BAW—1858). NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE85015421.

Reactor coolant (RC) pump seal failures have resulted in the excessive leakage of primary coolant into reactor containment buildings. In some cases, high levels of airborne activity and surface contamination following these failures have necessitate extensive cleanup efforts and personnel radiation exposure. The cost of reduced plant availability and increases in radiation exposure have been serious concerns to reactor vendors and the utilities. The RC pump monitoring and diagnostic system has been developed, designed, and installed at Toledo Edison's Davis-Besse Nuclear Power Station to examine the relationships between seal failures and the environment in which the pumps operate. The data collection task, started recently, will closely examine the rotordynamic aspects of pump behavior and the operational environment that is controlled by the plant operator to characterize the effects upon pump seal performance. 7 refs., 6 figs.

39117 (EPRI-NP—3802-Vol.1) Thermal and fluid mixing in a 1/2-scale test facility. Volume 1. Facility and test design report. Final report. Dolan, F.X.; Valenzuela, J.A. (Creare, Inc., Hanover, NH (USA)). Jul 1985. 141p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920739.

This report describes the test facility and program designed to measure fluid mixing and heat transfer in a 1/2-scale model of the cold leg downcomer and lower plenum of a pressurized water reactor under conditions of interest to the issue of pressurized thermal shock. Several cold leg assemblies are modeled and the downcomer arrangement can be altered to match vendor-specific configurations. The facility can be operated to model flow rates based on Froude number of the injected flow in the cold leg and with steady or transient inlet boundary conditions. Extensive instrumentation is provided to measure flow rates, temperatures and pressure at the facility boundaries and for detailed measurements of temperature, velocity and heat transfer data in the cold leg and downcomer models. The test data are monitored and recorded by a computer data acquisition system that is also used for post-test data reduction and plotting. The planned test matrix includes 75 tests with variations in cold leg and downcomer geometries, loop and HPI flow rates, cold leg Froude number and loop to HPI density difference. Test results will be reported in a series of quick look and final report.

39118 (EPRI-NP—4100) Advanced LWR program for small modularized plants. Final report. Braun, H.E.; Tower, S.N. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Water Reactor Divisions). Jul 1985. 211p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920745.

This report presents the results of a study of modular construction of a small, 600-MW(e), nuclear plant (NUPACK 600) to be built largely in a factory or shipyard and towed to a prelicensed site by barge. Design, economic, schedular, and licensing aspects are considered. It is concluded that the NUPACK 600 is feasible. NUPACK 600 has the potential for reducing the financial risks/uncertainties to the utilities for construction of future nuclear power plants. A development program is proposed, and additional studies are recommended to validate the benefits for the utility industry.

39119 (IAE—3820/4) Results of investigation of the WWER-1000 neutronics for Novovoronezh-5 NPP. Astakhov, S.A.; Boev, I.A.; Voznesenskij, V.A.; Dukhovenskij, A.S.; Epanechnikov, Yu.A.; Kamyshan, A.N.; Krajnov, Yu.A.; Ionov, V.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1983. 31p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701911.

English "cold" state (coolant temperature 20 deg C) and at the reactor in "hot" state (coolant temperature 110 and 280 deg C) at zero-power and at different power levels are given. The review of the reactor physical characteristics shows a quite sabisfactory coincidence of calculation and experimental data. The used calculation programs (biprus, ror, ni-7000) permit to predict correctly the effectiveness of the whole mechanical control system for all necessary states of the reactor core. The radial reactor core power-peaking factors at various power levels and different fuel burn-up levels have been correctly calculated. The experimental investigations confirm the positive reactivity coefficients predicted in accordance with medium temperature at the initial stage of the first operating cycle and axial xenon power oscillations in the reactor core.

39120 (INIS-BR—249) Thermal-hydraulic and neutronic analysis of pressurized water reactor cores. Alves, C.H. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1982. 107p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781418.

A computational code, named CANAL2, was developed for the simulation of the steady-state and transient behaviour of a Pressurized Water Reactor core. The conservation equations for the control volumes are obtained by area-averaging of the two-fluid model conservation equations and reducing them to the drift-flux model formulation. The resulting equations are aproximated by finite differences and solved by a marching-type numerical scheme. The model takes into account the exchange of mass, momentum and energy between adjacent subchannels of a fuel bundle. Turbulent mixing and diversion crossflow are considered. Correlations are provided for several heat transfer and flow regimes and selected according to the local conditons. During transients core power can be evaluated by a point-kinetics model. Fuel and coolant temperatures are feedback to the neutronics. The heat conduction equation is solved in the fuel using the Crank-Nicolson scheme. Temperature-dependent correlations are provided for the fuel and cladding thermal conductivities. Several runs were made with the code CANAL2 using the available experimental and calculated data in the open literature. Results indicate that CANAL2 is a good calculational tool for the thermal-hydraulics of PWR cores. A few refinements will make the code useful for design.

39121 (INIS-BR—260, pp 231-245) Individual economical value of plutonium isotopes and analysis of the reprocessing of irradiated fuel. Gomes, I.C.; Rubini, L.A.; Barroso, D.E.G. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

An economical analysis of plutonium recycle in a PWR reactor, without any modification, is done, supposing an open market for the plutonium. The individual value of the plutonium isotopes is determined solving a system with four equations, which the unknown factors are the Pu-239, Pu-240, pu-241 and Pu-242 values. The equations are obtained by equalizing the cost of plutonium fuel cycle of four different isotope mixtures to the cost of the uranium fuel cycle.

39122 (INIS-BR—260, pp 469) Model to calculate the burn of gadolinium in PWR. Sannazzaro, L.R. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

A cell model to calculate the burnup of a PWR fuel element with gadolinium as a poison, projected by KWU, is presented. With the model proposed, the burn of the gadolinium isotopes is analyzed, as well as the effect of these isotopes in the fuel element behaviour. The results obtained with this cell model are compared with those obtained by a conventional cell model.

39123 (INIS-BR—260, pp 367-384) Utilization of Relap 4 computer code in the water experimental loop at IPEN (Instituto de Pesquisas Energeticas e Nucleares). Sabundjian, G. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The Relap 4 - Mod 3 and Mod 5 are analyzed and compared. The behaviour of a water Experimental Loops (CEA) at IPEN was simulated for transients and for steady state. Tests were done only for PWR reactors. With these results, it is concluded that the modelling used for CEA, with Relap 4 code (Mod 3 and Mod 5) simulation was satisfactory. Comparing the two versions of Relap 4, the results from Mod 5 are best estimated than those from Mod 3.

39124 (INIS-BR—260) Proceedings of the 4th. Brazilian Meeting on Reactor Physics. (Comissao Nacional de Energia Nuclear de Brasil, Rio de Janeiro; Associacao Brasileira de Energia Nuclear, Rio de Janeiro). 1983. 469p. (In Portuguese). (CONF-8311246—). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434.

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

Some papers showed in the 4th. Brazilian Meeting on Reactor Physics are presented. The main subjects are: Reactor Physics, Reactor Accidents, Shielding and thermalhydraulics.

39125 (INIS-BR—260, pp 74-87) Optimization of Doppler reactivity in thermal reactors. Oliveira Martins, C.P. de; Silva, F.C. da; Thome Filho, Z.D. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

Using a Generalized Perturbation Theory (GPT), a formalism aiming to optimize the Doppler reactivity in a nuclear reactor, was developed. Using this formalism, as a consequence of the Doppler reactivity optimization process, the fuel enrichment was determined in the case of temperature excursions. An application of this formalism to a PWR type reactor, showed that the Doppler reactivity is dependent on the excess of reactivity.

39126 (INIS-BR—281) Thermal-hydraulic analysis of PWR cores in transient condition. Silva Galetti, M.R. da. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1984. 183p. (In Portuguese). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781490.

Thesis.

A calculational methodology for thermal - hydraulic analysis of PWR cores under steady-state and transient condition was selected and made available to users. An evaluation of the COBRA-IIIP/MIT code, used for subchannel analysis, was done through comparison of the code results with experimental data on steady state and transient conditions. As a result, a comparison study allowing spatial and temporal localization of critical heat flux was obtained. A sensitivity study of the simulation model to variations in some empirically determined parameter is also presented. Two transient cases from Angra I FSAR were analysed, showing the evolution of minimum DNBR with time.

39127 (INIS-mf—9479, pp 279-289) **VERONA - a core monitoring system of WWER-440 reactors.** Valko, J.; Vegh, E. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

The on-line core performance monitoring system VERONA, currently developed for the WWER-440 reactors of the Paks nuclear power plant is described. VERONA consists of a measuring equipment and a computer configuraton. The system periodically samples about 700 analogue and 300 digital signals. Power balances and power density distributions and related quantities are evaluated from the measured data, and the resulting information is presented to the operator in the form of display schemes, various printed logs and magnetic files.

39128 (INIS-mf—9736) **Royal Decree-Law 12/1982 of 27 August regulating State intervention in the Lemoniz nuclear power plant.** (International Atomic Energy Agency, Vienna (Austria)). 2 Aug 1982. 2p. (In Spanish). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781497.

Published in the Boletin Official del Estado.

This Royal Decree-Law sets out the conditions of intervention by the State in the achievement of the Lemoniz nuclear power plant with a view to accelerating the work. It sets up an Intervention Council responsible for directing the work which is empowered to take the necessary measures for discharging its duties. (NEA).

39129 (NUREG/CR—4249) **Pressure vessel fracture studies pertaining to the PWR thermal-shock issue: experiments TSE-5, TSE-5A, and TSE-6.** Cheverton, R.D.; Ball, D.G.; Bolt, S.E.; Iskander, S.K.; Nanstad, R.K. (Oak Ridge National Lab., TN (USA)). Jun 1985. Contract AC05-84OR21400. 250p. (ORNL—6163). NTIS, PC A11/MF A01 - GPO. File Number TI85013517.

Thermal-shock experiments TSE-5, TSE-5A, and TSE-6 were conducted for the purpose of investigating the behavior of surface flaws under pressurized-water-reactor (PWR) overcooling-accident conditions. These experiments were the fifth, sixth, and seventh in a series of thermal-shock experiments conducted with large steel cylinders (A 508 class-2 chemistry; 991-mm OD by 76- and 152-mm wall by 1.2-m length) as a part of the Heavy-Section Steel Technology (HSST) Program for this purpose. For each of these experiments, the initial flaw was on the inner surface and extended the full length of the cylinder. The thermal shock was applied to the inner surface only, and this was accomplished by effectively dunking the test cylinder, initially at ~93°C, into a large volume of liquid nitrogen. Results of the experiments have confirmed that (1) linear-elastic fracture-mechanics is valid for thermal-shock loading; (2) crack arrest will take place in accordance with recently developed crack-arrest concepts; (3) crack-arrest toughness values for rising and falling K/sub I/ fields are the same; (4) warm prestressing is effective in preventing crack initiation; (5) thermal shock alone cannot drive a flaw all the way through the wall; (6) dynamic effects for PWR-vessel thermal-shock loading conditions are negligible; (7) in the absence of cladding and under severe thermal-shock loading conditions, finite-length flaws will extend on the surface to become very long; and (8) there can be very large scatter in small-specimen fracture-toughness data. 24 refs., 114 figs., 29 tabs.

39130 (UNI-TH—3) **Development of a pressurizer level compensator for use on N Reactor.** Bussell, J.H. (UNC Nuclear Industries, Inc., Richland, WA (USA)). Jul 1985. Contract AC06-76RL01857. 160p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE85015171.

The instrument described in this report has been developed to compensate the measured water level in the N Reactor pressurizer for temperature effects. N Reactor is a pressurized water nuclear reactor (PWR). The instrument is defined as a pressurizer level compensator (PLC). A pressurizer is used in a PWR to control the primary coolant pressure and provide a surge volume for primary coolant expansion and contraction. A means of compensating for water and steam density is required because of the wide range of pressure and temperature that result from different steady state and transient reactor power levels. The uncompensated level is determined by measurement of differential pressure between the top of the level measurement zone and the bottom of the level measurement zone. Temperature of the water in the pressurizer is the parameter that is used to determine the proper level compensation since water and steam density are primarily functions of temperature in this case. The PLC uses a microprocessor to calculate the compensated level from temperature and differential pressure measurements. This report includes a description of the design, development, and implementation of software and hardware that are in the PLC. 9 refs., 51 figs., 17 tabs.

2103 Power Reactors, Non-breeding, Graphite Moderated

REFER ALSO TO CITATION(S) 39236, 39237, 39299, 39311, 39548

39131 (INIS-BR—260, pp 380-400) **Experimental investigation on the release of actinide and cesium from irradiated particles of spherical fuel element of high temperature reactor.** Teixeira e Silva, A. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)); Hecker, R.; Stoever, D. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The transport behaviour of actinides and cesium in irradiated particles such as BISO and TRISO, good and with failures, of the spherical fuel elements proposed to high temperature reactor is examined experimentally. The experimental procedures are presented and the computer code necessary are discussed. The diffusion coefficients of actinides-plutonium, americium and curium - as well as the cesium fission products are derived from the experimental data with the help of a numerical statistical treatment based on a single diffusion model in multizone spherical geometry. They are presented in the Arrhenius diagram form D=Doe sup(-Q/RT) for the U(Th)-O_2 core and for the coating layers HTI-PyC and SiC of the particle.

39132 (JAERI-M—84-096) **Carburization of UO_2 kernels in cracked particles and its effect on xenon release.** Tobita, Tsutomu; Ikawa, Katsuichi. (Japan Atomic Energy Research Inst., Tokyo). May 1984. 20p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701653.

A series of out-of-pile heating experiments has been carried out to study carburization of UO_2 kernels in cracked coated particles and its effect on xenon release. UO_2 kernels in cracked coating were carburized up to 80% in a week at 1300°C. Xenon release increased linearly with carburization. In an experiment of several hours heating at 1350°C, the amount of xenon released from completely carburized kernels was about 10 times larger than that from noncarburized ones.

2104 Power Reactors, Non-breeding, Otherwise Moderated Or Unmoderated

REFER ALSO TO CITATION(S) 39203, 39207, 39238, 39323, 39326, 39337

39133 (AECL—7546) Remotely controlled repair of piping at Douglas Point. Conrath, J.J. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. CANDU Operations). Jun 1983. 24p. (CONF-8209273—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701656.

From IAEA specialist meeting on repair aspects and procedures; Roskilde, Denmark (14 Sep 1982).

The 200 MWe Douglas Point Nuclear Generating Station which started operation in 1966 was Canada's first commercial nuclear power plant. In 1977, after 11 years of operation, leakage of heavy water was detected and traced to the Moderator Piping System (pipe sizes 19 mm to 76 mm) located in a vault below the reactor where the radiation fields during shutdown ranged up to 5000 R/Hr. Inspection using remotely operated TV cameras showed that a 'U' bolt clamp support had worn through the wall of one pipe and resulted in the leakage and also that wear was occurring on other pipes. An extensive repair plan was subsequently undertaken in the form of a joint venture of the designer-owner Atomic Energy of Canada Limited, and the builder-operator, Ontario Hydro. This paper describes the equipment and procedures used in remotely controlled repairs at Douglas Point.

39134 (INIS-mf—9592) Industrial technology transfer. Bulger, W. (Donlee Mfg. Industries Ltd., Weston, Ontario (Canada)). Jun 1982. 14p. (CONF-8206271—18). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781351.

From 22. annual international conference of the Canadian Nuclear Association; Toronto, Ontario, Canada (6 Jun 1982).

The transfer of industrial technology is an essential part of the CANDU export marketing program. Potential customers require the opportunity to become self-sufficient in the supply of nuclear plant and equipment in the long term and they require local participation to the maximum extent possible. The Organization of CANDU Industries is working closely with Atomic Energy of Canada Ltd. in developing comprehensive programs for the transfer of manufacturing technology. The objectives of this program are. 1) to make available to the purchasing country all nuclear component manufacturing technology that exists in Canada; and 2) to assure that the transfer of technology takes place in an efficient and effective way. Technology transfer agreements may be in the form of joint ventures or license agreements, depending upon the requirements of the recipient.

39135 (INIS-mf—9608) Management of a 600 MW CANDU project to facilitate electricity export. Gunter, G.E. (Maritime Nuclear Ltd., Fredericton, New Brunswick (Canada)). Jun 1983. 11p. (CONF-830660—19). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781349.

From 23. annual international conference of Canadian Nuclear Association; Montreal, Canada (12 Jun 1983).

The export of electricity from 600-MW CANDU nuclear power plants built in Canada remains feasible providing certain requirements continue to be met. The principal objective in developing nuclear power resources for export is that they must produce economically attractive electricity. A review of the experience of construction and operation of Point Lepreau Unit 1 suggests an inherent ability to reduce construction costs and shorten construction schedules so as to make electrical power output from these stations even more attractive to export customers.

39136 (INIS-mf—9635) Commissioning quality assurance at Pickering NGS. Wieckowski, J.T. (Ontario Hydro, Pickering (Canada). Pickering Generating Station). May 1983. 19p. (CONF-8305259—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781419.

From Canadian Nuclear Society commissioning symposium; Toronto, Ontario, Canada (3 May 1983).

Ontario Hydro decided in 1978 to implement a formal quality assurance program applicable to commissioning and operation of nuclear generating stations. Pickering NGS is the first station to have the commissioning quality assurance (CQA) program applied to it. This paper outlines the scope, implementation, and evaluation of the CQA program as applied to Pickering Unit 5.

39137 (INIS-mf—9636) Pickering NGS-A versus Pickering NGS-B: changes in commissioning techniques and their impact. Talbot, K.H. (Ontario Hydro, Pickering (Canada). Pickering Generating Station). May 1983. 22p. (CONF-8305259—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781420.

From Canadian Nuclear Society commissioning symposium; Toronto, Ontario, Canada (3 May 1983).

Modernization of equipment, changes in design codes and standards, and tightening of regulatory requirements have combined to make Pickering NGS-B in many ways different from its predecessor, Pickering 'A'. This paper briefly describes how a few selected commissioning techniques used to place Pickering 'A' into service were further developed to cope with the new requirements for Pickering 'B'. The relative performance of the commissioning programmes between the two stations is also compared.

39138 (INIS-mf—9637) Commissioning approaches used in Japan Fugen 165 MW(e) HWR. Akebi, M.; Ohteru, D. (Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan)). May 1983. 17p. (CONF-8305259—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781421.

From Canadian Nuclear Society commissioning symposium; Toronto, Ontario, Canada (3 May 1983).

Fugen is a 165 MW(E) prototype heavy water reactor which uses uranium-plutonium mixed oxide (MOX) fuel. Site construction started at Tsuruga in the Fukui-prefecture in December 1970, and the plant went into commercial operation in March 1979. This paper covers the commissioning during the period from the initial fuel loading to the commencement of commercial operation, and describes commissioning approaches used in Fugen with special emphasis on planning, organization, programme management and some features on commissioning techniques.

39139 (INIS-mf—9638) Point Lepreau G.S. commissioning management experience. Alikhan, S. (New Brunswick Electric Power Commission, Fredericton (Canada)); Walker, W.J. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. Power Projects). (New Brunswick Electric Power Commission, Fredericton (Canada)). May 1983. 36p. (CONF-8305259—7). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781422.

From Canadian Nuclear Society commissioning symposium; Toronto, Ontario, Canada (3 May 1983).

This paper shares the experience gained by New Brunswick Power in commissioning its first nuclear plant, with particular emphasis on the management techniques that were developed. Some of the areas discussed include: organization of Nuclear Operations Group responsible for commissioning and its interface with construction; outline and scope of documentation required to define, execute and report commissioning to satisfy the licensing requirements, management techniques developed to implement commissioning; and a summary of lessons learned and recommendations for the future.

39140 (INIS-mf—9639) AECL's participation in the commissioning of Point Lepreau generating station unit 1. Chawla, S.; Singh, K.; Yerramilli, S. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. CANDU Operations). May 1983. 13p. (CONF-8305259—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781423.

From Canadian Nuclear Society commissioning symposium; Toronto, Ontario, Canada (3 May 1983).

Support from Atomic Energy of Canada Ltd. (AECL) to Point Lepreau during the commissioning program has been in the form of: seconded staff for commissioning program management, preparation of commissioning procedures, and hands-on commissioning of several systems; analysis of test results; engineering service for problem solving and modifications; design engineering for changes and additions; procurement of urgently-needed parts and materials; technological advice; review of operational limits; interpretation of design manuals and assistance with and preparation of

submissions to regulatory authorities; and development of equipment and procedures for inspection and repairs. This, together with AECL's experience in the commissioning of other 600 MWe stations, Douglas Point and Ontario Hydro stations, provides AECL with a wide range of expertise for providing operating station support services for CANDU stations.

39141 **(INIS-mf—9643) Commissioning of nuclear power plants. Current requirements and future directions.** Ewing, B.M. (Atomic Energy Control Board, Ottawa, Ontario (Canada)). May 1983. 11p. (CONF-8305259—12). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781427.

From Canadian Nuclear Society commissioning symposium; Toronto, Ontario, Canada (3 May 1983).

The basic objective of commissioning programs is to demonstrate that systems will operate as designed. This involves testing under conditions which simulate normal, upset and accident conditions. Experience with commissioning of plants supports the current commissioning practices and suggests improvements that should be made.

39142 (INIS-mf—9644, pp 3-10) **Nuclear plants and economic risk.** O'Connor, A.J. (New Brunswick Electric Power Commission, Fredericton (Canada)). 1983. NTIS (US Sales Only), PC A08/MF A01. File Number DE85781436. (CONF-8211206—).

From Seminar on uranium and nuclear issues; Toronto, Ontario, Canada (2 Nov 1982).

The Point Lepreau-1 nuclear power plant was considerably more costly to build than was forecast at the start of the project. A number of factors combined to lengthen the construction schedule and increase costs. Massive commodity increases required for the plant construction coupled with extensive control system additions, underestimates of engineering effort resulting in schedule delays, manufacturing delays, changing regulations, labour problems, and the high cost of money were contributing factors. Although Point Lepreau was the third reactor of its type to start construction it was the first completed, and all the difficulties associated with prototyping were encountered. A second reactor of the same type could be built more quickly and cheaply using the experience gained in building this one.

39143 (INIS-mf—9644, pp 127-147) **Canadian nuclear industry: worth fighting for?.** L'Archeveque, R. (Canatom Ltd., Montreal, Quebec (Canada)). 1983. NTIS (US Sales Only), PC A08/MF A01. File Number DE85781436. (CONF-8211206—).

From Seminar on uranium and nuclear issues; Toronto, Ontario, Canada (2 Nov 1982).

The nuclear industry in Canada is in trouble because of the apparent lack of markets for the CANDU reactor. The author proposes a strategy to find and service markets outside Canada. All sectors of government and the nuclear industry must cooperate to integrate CANDU, its components and related services as an element of Canada's international trade with the target countries. Policies on nuclear-related matters, financing of sales and international trade, and coordination between sectors of the industry are areas that must be addressed.

39144 **(INIS-mf—9704) Study of Xe poisoning effect on fuel displacement strategies in a nuclear electric plant equipped with a natural uranium - heavy water reactor.** Mihailescu, N. (Institutul de Fizica si Inginerie Nucleara, Bucharest (Romania)). 1983. 23p. (In Romanian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781325.

Summary of a doctorate thesis.

The effect of Xenon poisoning on fuel handling strategies in a natural uranium reactor was studied. A computer code, called PRODFIS was devised to have a permanent control on the concentrations of fission products, allowing to obtain the concentration values for a fission product, at any moment. This computer code can simultaneously follow 19 fission products and supply information at different time intervals depending on the computer storage used. The problems concerning the behaviour of Xe and Sm concentrations in the reactor and their influence on its functioning were mathematically treated. The influence of Xe concentration oscillations on the functioning of a natural uranium-heavy water reactor was analysed by means of a computer code called OSCXEN that allowed us to obtain the radial and axial values for fast and thermal neutron flows at certain time intervals and iodine and Xenon concentration values on different time ranges. Dynamic programming methods were applied to the study of the control of Xe and Sm poisoning, obtaining the solutions for two aspects of this problem, namely the minimization of the Xe concentration value and Xe concentration maximum. This problem is solved by using a control system of "bang-bang" type. A computer code called XENPROG was devised to determine the best version for the neutron flow when the reactor is stopped in such a way as the two conditions imposed by Xe concentration minimization or minimization of Xe concentration maximum to be fulfilled. Experimental measurements were performed on the V/V. R-S reactor in order to verify the results obtained with XENPROG channel. Agreement between experimental results, applying XENPROG code indications, and results obtained by means of calculation confirms the correctness of the computer code.

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 38840, 39196, 39230, 39246, 39249, 39250, 39253, 39299, 39306, 39307, 39309, 39313, 39328, 39359, 39524, 39525, 39527, 39528, 39529, 39530, 39531, 39532, 39533, 40657

39145 **(ANL—85-35) Fluid forces on two circular cylinders in crossflow.** Jendrzejczyk, J.A.; Chen, S.S. (Argonne National Lab., IL (USA)). Jun 1985. Contract W-31-109-ENG-38. 60p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85014294.

Fluid excitation forces are measured in a water loop for two circular cylinders arranged in tandem and normal to flow. The Strouhal number and fluctuating drag and lift coefficients for both cylinders are presented for various spacings and incoming flow conditions. Results show the effects of Reynolds number, pitch ratio, and upstream turbulence on the fluid excitation forces.

39146 **(CONF-850809—7) Implicit finite element structural dynamic formulation for long-duration accidents in reactor piping systems.** Wang, C.Y. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85006842.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

This taper describes an implicit three-dimensional finite-element formulation for the structural analysis of reactor piping system. The numerical algorithm considers hoop, flexural, axial, and torsion modes of the piping structures. It is unconditionally stable and can be used for calculation of piping response under static or long duration dynamic loads. The method uses a predictor-corrector, successive iterative scheme which satisfies the equilibrium equations. A set of stiffness equations representing the discretized equations of motion are derived to predict the displacement increments. The calculated displacement increments are then used to correct the element nodal forces. The algorithm is fairly general, and is capable of treating large displacements and elastic-plastic materials with thermal and strain-rate effects. 7 refs., 7 figs.

39147 **(CONF-850903—3) Aiming toward perfection with POBSYS, a new software system.** Osudar, J.; Parks, J.E.; Levitz, N.M. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85007986.

From International topical meeting on computer applications for nuclear power plant operation and control; Pasco, WA, USA (8 Sep 1985).

An integrated general-purpose software system, POBSYS, has been developed that provides the foundation and tools for building a highly interactive system for carrying out detailed operating procedures and performing conventional process control, data acquisition, and data management functions. Features of the present system, which may be of particular interest to the problem of the man-machine interface include: (a) a multi-level safety system for fail-safe operation; (b) hierarchical operational control; (c) documented responsibility; (d) equipment status tracking; and (e) quality

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assurance checks on operations. The system runs on commercially available microprocessors and is presently in use in the destructive analysis of irradiated fuel rods from the Light Water Breeder Reactor.

39148 **(FEI—1517) Few-group constant preparation for reactor calculation in three-dimensional hexagonal geometry.** Pivovarov, V.A.; Seregin, A.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1984. 23p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701910.

Technique for preparation of few-group constants for reactor calculation in three-dimensional hexagonal geometry is described. The technique is based on using a special 26-group calculation in the same geometry as few-group calculation. Numerical results obtained for models of SNR-300, BN-350, BN-1600 reactors reveal that the suggested technique can be sucessfully used for solving practical problems of reactor calculation.

39149 **(INIS-BR—256) Calculation of pressure drop and flow redistribution in the LMFBR core.** Morgado, O.J. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil)). 1984. 185p. (In Portuguese). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781428.

The flow redistribution through fuel assemblies of LMFBRs: for the correct calculation of mass flow rates and pressure drop, are studied. Using a quasi-static formulation of conservation equations of mass and energy, a computer program was developed to simulate any arbitrary number of flow channels, operating at different linear power levels. Therefore f flow channels, operating at different linear power levels. Therefore, it was possible to perform thermal transient calculations for the Clinch River reactor core. The results of the calculations agree with the data found in the literature and supply accurate information about flow redistribution, average temperature, and pressure drop in the core, when the reactor is operated at conditions from the designed flow conditions, as is always the case in a load changing operation, or during transients.

39150 (INIS-BR—260, pp 88-105) **Optimization of enrichment zones that maximize the regeneration profits in a fast reactor.** Jachic, J. (Instituto de Engenharia Nuclear, Rio de Janeiro (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

Using a simplified model of Super Phenix reactor, the admissible limits of internal and external enrichment core without control rods, that assure an auto-stability related to fuel Doppler coefficient were determined. A Linear Programming System was developed to solve this problem, using the SIMPLEX method. The solution showed that the regeneration profits could be increased at least in 14% if the internal enrichment core decrease 0.97 and the external 0.3%.

39151 (INIS-BR—260, pp 154-168) **Uncertainty analysis of parameters in a fast reactor using sensitivity calculations.** Renke, C.A.C. (Instituto de Engenharia Nuclear, Rio de Janeiro (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

Uncertainties analysis of parameters as K sub(eff) and the breeding internal ratio, related to a Super Phenix reactor is presented, using the variational perturbation theory. The total imprecisions determined in those calculations were compared with the precision required level for these parameters, showing the necessity of updating the incertainties values considered in the cross sections, with the more recent evaluation results. The data to be evaluated, were identified by the sensitivity values.

39152 (INIS-BR—260, pp 179-192) **Option for the Brazilian nuclear project: necessity of fast breeder reactors and core design for an experimental fast reactor.** Ishiguro, Y. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Estudos Avancados). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

Aiming to assure the continued utilization of fission energy, the development of fast breeder reactors (FBRs) is a necessity. Binary fueled LMFBRs are proposed, as the best type for the Brazilian nuclear system in the future. The inherent safety characteristics are superior to current fast breeder reactors and an efficient utilization of thorium can be realized. The construction and operation of an experimental fast reactor is the first step and a basic tool for the development of FBRs technologies. A series of core design for an 90 MW FBR is studied and the possible options and sizes of the main parameters are identified.

39153 (INIS-BR—260, pp 193-205) **Burnup characteristics of binary breeder reactors.** Dias, A.F.; Nascimento, J.A. do; Ishiguro, Y. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Estudos Avancados). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The burnup calculation of a binary breeder reactor for two loading cases is presented. In one case, the internal core, loaded with U-233/Th, and the external core, loaded with Pu/U, have the same number of fuel bundles. In the other case, the two more external rings, of the internal core, are loaded with Pu/U. The second case is considered for an initial phase of the thorium cycle, when, probably, the supply of U-233 could be limited. The results show an efficient breeding in the thorium cycle for both cases.

39154 **(JAERI-M—83-217) Conceptual design study on actinide burning fast reactor.** Osugi, Toshitaka; Yoshida, Hiroyuki; Tanaka, Ryokichi. (Japan Atomic Energy Research Inst., Tokyo). Dec 1983. 90p. (In Japanese). NTIS (US Sales Only), PC A05/MF A01. File Number DE85701649.

In order to alleviate actinide waste issues, a conceptual design study on helium-cooled ABFR (He-ABFR) has been made, since helium cooling provides much harder neutron spectrum than sodium cooling and hence permits more efficient utilization of threshold fission reaction potential of actinides to be transmuted. The nominal reactor power was selected to be around 1000 MWt, considering that the annual actinide transmutation ability of the reactor should be 300 kg/yr of actinide waste excluding U-238 which corresponds to amount annually produced from 10 units of 1000 MWe power reactors. An extensive parametric study on the He-ABFR, basing on the currently available neutron cross-section data and material data of actinides, showed that the He-ABFR operated entirely on the actinide waste is conceptually feasible from the viewpoints of neutronics and thermo-hydraulics and also showed that the He-ABFR is one of the effective tools to transmute hazardous and extremely long-lived actinides. Simultaneously, the study pointed out that the minimization of initial actinide inventory should be needed, when considering very low actinide productivity of conventional power reactors, and that the problems concerning high radiation and the decay heat release from actinides would impose some penalties in actinide handling facilities such as fabricating plants.

39155 **Structural research needs for Clinch River Breeder Reactor licensing.** Butler, T.A. (Los Alamos National Lab., NM (USA)). *Nuclear Engineering and Design;* **79**: No. 2, 137-143(May 1984). (CONF-830805—).

From 7. international conference on structural mechanics in reactor technology; Chicago, IL, USA (22 Aug 1983).

This paper discusses several structural issues for the Clinch River Breeder Reactor Plant (CRBRP) that need to be investigated before the review for an operating license begins. The issues exist because of differences between the CRBRP structures and typical light water reactor (LWR) plant structures. CRBRP structures are

generally larger and must withstand loads characterized by lower pressures and higher temperatures than occur in LWRs. In the paper each major issue is described along with research needed to determine its impact on plant safety.

2106 Power Reactors, Auxiliary, Mobile, Package, And Transportable

39156 **(EGG-M—13484) Ground test facility for nuclear testing of space reactor subsystems.** Quapp, W.J.; Watts, K.D. (EG and G Idaho, Inc., Idaho Falls (USA)). 1985. Contract AC07-76ID01570. 4p. (CONF-850103—11). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014634.

From 2. symposium on space nuclear power systems; Albuquerque, NM, USA (14 Jan 1985).

Two major reactor facilities at the INEL have been identified as easily adaptable for supporting the nuclear testing of the SP-100 reactor subsystem. They are the Engineering Test Reactor (ETR) and the Loss of Fluid Test Reactor (LOFT). In addition, there are machine shops, analytical laboratories, hot cells, and the supporting services (fire protection, safety, security, medical, waste management, etc.) necessary to conducting a nuclear test program. This paper presents the conceptual approach for modifying these reactor facilities for the ground engineering test facility for the SP-100 nuclear subsystem. 4 figs.

39157 **(LA-UR—85-1870) Low power reactor for remote applications.** Meier, K.L.; Palmer, R.G.; Kirchner, W.L. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 7p. (CONF-850808—6). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85012763.

From 20. intersociety energy conversion engineering conference; Miami Beach, FL, USA (18 Aug 1985).

A compact, low power reactor is being designed to provide electric power for remote, unattended applications. Because of the high fuel and maintenance costs for conventional power sources such as diesel generators, a reactor power supply appears especially attractive for remote and inaccessible locations. Operating at a thermal power level of 135 kWt, the power supply achieves a gross electrical output of 25 kWe from an organic Rankine cycle (ORC) engine. By intentional selection of design features stressing inherent safety, operation in an unattended mode is possible with minimal risk to the environment. Reliability is achieved through the use of components representing existing, proven technology. Low enrichment uranium particle fuel, in graphite core blocks, cooled by heat pipes coupled to an ORC converter insures long-term, virtually maintenance free, operation of this reactor for remote applications. 10 refs., 7 figs., 3 tabs.

2107 Regulation And Licensing

REFER ALSO TO CITATION(S) 39128, 39331, 39349

39158 **(INIS-BR—269) Nuclear energy insertion in the Brazilian electric system - Institutional and legal aspects.** Faria, N.M. de. (Comissao Nacional de Energia Nuclear de Brasil, Rio de Janeiro). 1983. 43p. (In Portuguese). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781494.

The nuclear energy exposure in Brazil is presented, in view of its institutional and legal aspects. (A.L.).

39159 **(INIS-mf—9661) Ordinance of 18 January 1984 on definitions and licences in the atomic energy field.** (International Atomic Energy Agency, Vienna (Austria)). 18 Jan 1984. 24p. (In French). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781429.

This Ordinance (RS 732.11) repeals the 1978 Ordinance on definitions and licences in the atomic energy field with the exception of Annexes 2 and 3 and concerns in particular, the licensing procedure for atomic installations. It also regulates the export, import and transit of nuclear materials and equipment.

39160 **(INIS-mf—9663) Ordinance of 28 November 1983 on protection in case of emergencies in the neighbourhood of nuclear installations.** (International Atomic Energy Agency, Vienna (Austria)). 28 Nov 1983. 9p. (In French). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781455.

This Ordinance (RS 732.23) lays down the measures to be taken to assure the security of the population neighbouring nuclear installations. It defines the tasks of the nuclear operator, the Federal services as well as those of the Cantons and Communes. The Ordinance fixes the exact allocation of the costs of the emergency organisation and alarm system. The Ordinance entered into effect on 1 January 1984.

39161 **(INIS-mf—9665) Ordinance of 14 March 1983 on the supervision of nuclear installations.** (International Atomic Energy Agency, Vienna (Austria)). 14 Mar 1983. 2p. (In French). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781431.

This Ordinance (RS 732.22) which entered into force on 1 April 1983 stipulates that the Principal Nuclear Safety Division (DSN) is the authority responsible for supervision in the field of nuclear safety and protection against radiation from nuclear installations. Its powers are delegated by the Federal Office for Energy.

39162 **(INIS-mf—9674) Decree No. 83/7405 of 18 November 1983 on the licensing procedure for nuclear installations.** (International Atomic Energy Agency, Vienna (Austria)). 18 Nov 1983. 26p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781432.

This Decree (No. 83/7405) on the licensing procedure for nuclear installations came into force on 19 December 1983 and supersedes Decree No. 7/9141 of 5 December 1974 on the same subject. The general lines of the licensing procedure laid down by this new Decree are similar to that provided by the 1979 Decree; it is also carried out in three stages: site, construction and operating licences are delivered in succession.

39163 **(INIS-mf—9735) Decree 2869/1972 of 21 July approving the Regulations on nuclear and radioactive installations.** (International Atomic Energy Agency, Vienna (Austria)). 24 Oct 1972. 10p. (In Spanish). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781496.

Published in the Boletin Official del Estado.

This Decree determines nuclear and radioactive installations and establishes their licensing system which is carried out in several stages and differs according to the category concerned. The procedures cover in particular prior authorization, construction licence and operating licence. Provision is also made for inspections. The Annex to the Decree classifies the radionuclides for determining the category of the installation. (NEA).

39164 **(NUREG—0540-Vol.7-No.4) Title List of Documents Made Publicly Available, April 1-30, 1985. Volume 7, No. 4.** (Nuclear Regulatory Commission, Washington, DC (USA). Div. of Technical Information and Document Control). Jun 1985. 483p. NTIS, PC A21/MF A01 - GPO. File Number TI85901728.

The Title List of Documents Made Publicly Available is a monthly publication. It contains descriptions of the information received and generated by the US Nuclear Regulatory Commission (NRC). This information includes (1) docketed material associated with civilian nuclear power plants and other uses of radioactive materials and (2) nondocketed material received and generated by NRC pertinent to its role as a regulatory agency. As used here, docketed does not refer to Court dockets; it refers to the system by which NRC maintains its regulatory records. This series of documents is indexed by a Personal Author Index, a Corporate Source Index, and a Report Number Index. This issue covers April 1985.

2108 Economics

REFER ALSO TO CITATION(S) 39084, 39121, 39142, 39333, 39336, 39390, 39395, 39411, 39412, 39413

39165 (CONF-850412—, pp 3, Paper 3) **How accreditation can help achieve excellence in training programs.** Jackson, R.E.; Waid, J.R. (Arkansas Power and Light, Little Rock). Apr 1985. NTIS, PC A13/MF A01. File Number DE85010098.

From 6. symposium on the training of nuclear facility personnel; Nashville, TN, USA (15 Apr 1985).

At Arkansas Nuclear One we believe that the accreditation process is one mechanism by which a utility can achieve excellence. If a utility is striving for excellence in its training program three benefits can be gained from using the accreditation process: the utility can compare, build and evaluate against set standards, the utility can better define staffing and resource requirements, and the utility should be able to see measurable improvements after completing the process.

39166 (CONF-850412—, pp 5, Paper 5) **What's most worth doing: the training manager's dilemma.** Ward, W.G. Apr 1985. NTIS, PC A13/MF A01. File Number DE85010098.

From 6. symposium on the training of nuclear facility personnel; Nashville, TN, USA (15 Apr 1985).

The management of a training function is enough like other management jobs that there is little reason to dwell on the needed skills of communication, planning, staffing, budgeting, and controlling. Those can be learned almost anywhere. On the other side, the management of a training function is enough different that having just those skills will never be sufficient to accomplish even a mediocre job as a training manager. It is upon those elements of difference that the author concentrates the thrust of this presentation. The author attempts to accomplish the expression of those differences by relating personal views and philosophy of training and tying those views to why and how a training manager decides what is most worth doing. The author speaks from experience at Susquehanna nuclear power plant.

39167 (CONF-850412—, pp 4, Paper 21) **Use of surrogate travel to lower training costs and reduce person-rems.** Scully, M.C.; Porter, N.J.; Scott, J.W. (Southern California Edison). Apr 1985. NTIS, PC A13/MF A01. File Number DE85010098.

From 6. symposium on the training of nuclear facility personnel; Nashville, TN, USA (15 Apr 1985).

In the commercial nuclear power industry where access on site may be prohibited by regulations, procedures, or the potential of extremely high radiation levels, a surrogate travel system has potential for the reduction of both exposure and personnel training time. A prototype surrogate travel system using a microcomputer-assisted laser optical video disc has been developed by Southern California Edison and Combustion Engineering.

39168 (CONF-850412—, pp 5, Paper 25) **Use of task analysis in early program development.** Hodges, L.G. (Arkansas Power and Light, Little Rock). Apr 1985. NTIS, PC A13/MF A01. File Number DE85010098.

From 6. symposium on the training of nuclear facility personnel; Nashville, TN, USA (15 Apr 1985).

At Arkansas Nuclear One the Instructional Systems Development (ISD) process utilizing a Position Task Analysis is being used in the early program development of Chemistry/Radiochemistry and Health Physics training programs. An accurate Position Task Analysis (also known as a Job Task Analysis) is an essential first step in the ISD process. The Position Task Analysis will allow developers to determine terminal and enabling objectives, a training sequence and knowledge and skills entry levels for training.

39169 **(CONF-8506100—3) Collection and analysis of training simulator data.** Krois, P.A.; Haas, P.M. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 24p. NTIS, PC A02/MF A01 - GPO. File Number TI85015043.

From 3. IEEE conference on human factors and power plants; Monterey, CA, USA (23 Jun 1985).

The purposes of this paper are: (1) to review the objectives, approach, and results of a series of research experiments performed on nuclear power plant training simulators in support of regulatory and research programs of the US Nuclear Regulatory Commission (NRC), and (2) to identify general research issues that may lead to an improved research methodology using the training simulator as a field setting. Research products consist of a refined field research methodology, a data store on operator performance, and specific results pertinent to NRC regulatory positions. Issues and potential advances in operator performance measurement are discussed.

39170 (INIS-mf—9532, pp 96-97) **Professional education. Problems and perspectives.** Goodman, J. (Bechtel Power Corp., Norwalk, CA (USA)); Goodman, R. 1983. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780892. (CONF-831241—Summ.).

From Joint US/Israeli meeting on safety and siting problems for power reactors in a small country; Haifa, Israel (20 Dec 1983).

Published in summary form only.

22 NUCLEAR REACTOR TECHNOLOGY

39171 **(UJV—6877-R-V) Progress report '1983. [Institute of Nuclear Research].** (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). Mar 1984. 66p. (In Czech). NTIS (US Sales Only), PC A04/MF A01. File Number DE85781352.

In 1983 the Institute of Nuclear Research implemented three main research projects: problems of the development of the nuclear power complex in Czechoslovakia, non-power use of ionizing radiation in the national economy, and problems of radiation safety. The said problems were further subdivided into: reactor physics, reactor technology, reactor materials, radiochemical technology, nuclear safety, standardization, radiation technology, radiopharmaceuticals, neutron activation analysis and neutron radiography. Briefly described are research and development, production and service activities and special technical and computer services provided by the Institute. A general characteristic is presented of the Institute, of its organization, economy, scientific and educational work and the fulfilment of its social programme.

2201 Theory And Calculation

REFER ALSO TO CITATION(S) 39148, 40651, 40652, 40653, 40654, 40655, 40656, 40657, 40658, 40659, 40660, 40864, 40887

39172 **(FEI—1454) Effect of the method used for the reflector group constant averaging on the neutron effective multiplication factor Ksub(eff).** Shulepin, V.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1983. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701909.

The effect of the method used for the reflector constant averaging on the neutron effective multiplication factor Ksub(eff) of thermal reactor is shown. Using bilinear averaging method a more accurate Ksub(eff) value than in case of neutron flux averaging is obtained. It has been elucidated that the cause of Ksub(eff) inaccuracy in flux averaging is reflector albedo overestimating. A combined calculation method of the reflector-equipped reactor, using both methods of constants averaging, is suggested.

39173 (IAEA-SMR—93, pp 207-261) **Temperature dependence of neutron cross-sections and resonance integrals, and safety problems.** Rothenstein, W. (Technion-Israel Institute of Technology Haifa). Apr 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781405. (CONF-820163—Pt.1).

From Winter college on nuclear physics and reactors; Trieste, Italy (25 Jan 1982).

This lecture consists of the following topics: 1) A description of the basic nuclear data needed for resonance absorption calcula-

tions. 2) A treatment of the resonance shielding problem, for different homogeneous mixtures of a resonance absorber in infinite moderating media. 3) Discussion of multigroup spectrum calculations at epithermal energies. 4) Resonance reaction rate calculations in lattice unit cells. 5) Results of lattice analysis studies with accurately calculated resonance reaction rates, for a number of problems. A final discussion is given to indicate how accurate resonance reaction rate calculations may be used to validate or correct simple resonance shielding algorithms. 56 references.

39174 (IAEA-SMR—93, pp 279-334) **Formats and processing of evaluated nuclear data into multigroup cross-sections.** Motta, M. (ENEA, Italian National Committee for Nuclear and Alternative Energy Sources, Bologna, Italy). Apr 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781405. (CONF-820163—Pt.1).

From Winter college on nuclear physics and reactors; Trieste, Italy (25 Jan 1982).

The first part of these lectures concerns the data in nuclear files and their manipulation. The structure of the data files as divided into the resonance region (subdivided into the resolved and the unresolved regions) and the continuum region is presented. The reactions concerned are the elastic scattering; the radiative capture and the fission methods for averaging the cross sections are given. Then, the group averaging formulas and the self-shielding factors are presented in some detail. The second part concerns a presentation of nuclear data files handling and conversion. The main libraries are listed and several maintenance computer codes presented. The way the conversion among different files is handled is also presented. The listings of several BASIC programs for different cross section calculations are given. These codes are self-guided.

39175 (IAEA-SMR—93) **Nuclear theory for applications - 1982. Proceedings of the course on advances in nuclear theory and nuclear data for reactor applications held at Trieste, 25 January-19 February 1982 during the winter college on nuclear physics and reactor jointly organized by the IAEA and the ICTP and held at the ICTP, Trieste, 25 January-26 March 1982.** (International Atomic Energy Agency, Vienna (Austria); International Centre for Theoretical Physics, Trieste (Italy)). Apr 1984. 348p. (CONF-820163—Pt.1). NTIS (US Sales Only), PC A15/MF A01. File Number DE85781405.

From Winter college on nuclear physics and reactors; Trieste, Italy (25 Jan 1982).

Separate abstracts are presented for each of the conference papers included in the data base.

39176 (INIS-BR—255) **Evaluation and reffinement of the neutronic calculation methodology.** Conti Filho, P. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil)). 1984. 94p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE85781433.

A computational code that has the homogenized cross section given by the LEOPARD code as input was developed. The code gives polinomial coefficients that represent the homogenized cross section as a function of the local burnup and the boron concentration for the assembly, for each step in the reactor burnup. Lately, were developed an interface between the LEOPARD code Polinomiun Generator program and CITATION code to became possible to CITATION code to set the homogenized microscopic cross section as function of the local caracteristics of the assembly on the way to make the calculation of the reactor burnup. For a choosen reactor (1900MWth) have been done the inicial calculation (super-cells calculation and others input) and after that were done the calculation with and without the polinomia. The analyses of the results of the CITATION code were done and the principal results were presented here.

39177 (INIS-BR—260, pp 5-17) **Application of the finite element method in the solution of steady state diffusion equation.** Ono, S. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Estudos Avancados); Maiorino, J.R. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The solution of the neutron diffusion equation in steady state is obtained by the Finite Element Method. The variational technique for one dimensional problem and the Galerkin method for one and two-dimensional problems are used. Rectangular elements are used to divide the spatial domain and the neutron flux is approximated by a linear (one dimensional case) and a two-linear function (two dimensional case). Numerical results was obtained by a computer code and compared with the results from CITATION computer code.

39178 (INIS-BR—260, pp 33-45) **Modification in the CITATION computer code: change of microscopic cross sections by zone.** Yamaguchi, M.; Kosaka, N. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

Some modifications done in the CITATION computer code are presented, aiming to calculate the accumulated burnup for each reactor zone in each step of burnup and allow changing the microscopic cross sections for each zone in accordance to the burnup accumulated after each step of burnup. Some input data were put in the computer code. The alterations were tested and the results were compared with and without modifications.

39179 (INIS-BR—260, pp 46-61) **Development of a methodology to generate materials constant for the FLARE-G computer code.** Martinez, A.S.; Rosier, C.J.; Schirru, R.; Silva, F.C. da; Thome Filho, Z.D. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The methodology of calculation aiming to determine the parametrization constants of the multiplication factor and migration area is presented. These physical parameters are necessary in the solution of the diffusion equation with the nodal method, and they represent the adequated form of the macrogroup constants in the cell calculation. An automatic system was done to generate the parametrization constants.

39180 (INIS-BR—260, pp 62-73) **Two-energy group solution of the diffusion equation by the multidimensional nodal polynomial expansion method.** Ribeiro, R.D.M.; Vellozo, S.O. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil)); Botelho, D.A. (Instituto de Engenharia Nuclear, Rio de Janeiro (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The EPON computer code based in a Nodal Polynomial Expansion Method, written in Fortran IV, for steady-state, square geometry, one-dimensional or two-dimensional geometry and for one or two-energy group is presented. The neutron and power flux distributions for nuclear power plants were calculated, comparing with codes that use similar or different methodologies. The availability, economy and speed of the methodology is demonstrated.

39181 (INIS-BR—260, pp 141-151) **Numerical resolution of the neutron transport equation by Octuplo-Po method.** Ribas, H.B.; Cunha Menezes Filho, A. da (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The development of Octuplo-Po equations, from neutron transport equation, the numerical procedure for the solution of the equation, some validation tests, and some conclusions are presented.

39182 (INIS-BR—260, pp 272-280) **Discrepancies in the critical parameters in the utilization of different sets of cross sections.** Caldeira, A.D.; Vellozo, S.O. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

A comparative study between cross section sets, using the one-dimensional neutron transport theory, for homogeneous mixtures of uranium, plutonium and thorium in spherical and cylindrical geometry is presented. The variation of a critical radii or critical diameter of the solution is compared with theoretical and experimental data. A Hansen-Roach cross section and a cross sections set generated by Gamtec-II computer code were used. Moderated and submoderated systems were studied.

39183 (INIS-BR—260, pp 401-408) **Negative flux occurrence in gamma radiation transport problems.** Garcia, R.D.M. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The occurrence of negative angular fluxes caused by polynomials representations of the scattering cross section used in the solution of gamma radiation transport problem in the energy multigroup model is discussed. A basic problem was defined, for which accuracy results furnished by the F sub(N) method was used as reference to evaluate S sub(N) results with and without using negative flux fix-up. The results show that the occurrence of negative angular flux affects the values calculated by the S sub(N) method for the albedos of the most high energy group while the transmission factors of the group are not affected.

39184 (INIS-BR—260, pp 409-425) **Study and application of Dot 3.5 computer code in radiation shielding problems.** Otto, A.C. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil)); Mendonca, A.G.; Maiorino, J.R. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The application of nuclear transportation code S sub(N), Dot 3.5, to radiation shielding problems is revised. Aiming to study the better available option (convergence scheme, calculation mode), of DOT 3.5 computer code to be applied in radiation shielding problems, a standard model from 'Argonne Code Center' was selected and a combination of several calculation options to evaluate the accuracy of the results and the computational time was used, for then to select the more efficient option. To illustrate the versatility and efficacy in the application of the code for tipical shielding problems, the streaming neutrons calculation along a sodium coolant channel is ilustrated.

2202 Components And Accessories

REFER ALSO TO CITATION(S) 39092, 39204, 39240, 39251, 39252, 39371, 39565, 39616, 39756, 40887, 41083

39185 **(CEA-CONF—7437) R and D advances in high temperature thermocouples for nuclear utilization in severe environment.** Schley, R.; Blanc, J.Y. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Sep 1984. 9p. (CONF-8409109—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE85751990.

From Industrial temperature measurement symposium; Knoxville, TN, USA (10 Sep 1984).

Safety experiments for water reactors in Cadarache have made necessary a research program for developing special thermocouples for use in severe fuel damage conditions (superheated steam). Standard cladding thermocouples (type K, alumina insulated, zircaloy sheathed, O.D. 0.7 mm) must be replaced by others with W3Re versus W25Re legs, Ta sheath protected by a zircaloy outer sheath, and hafnia or thoria insulation. The zircaloy sheath will be sufficient to protect correctly tantalum. Fuel centerline thermocouples have W5Re versus W26Re or W3Re versus W25Re legs, hard-fired thoria insulation and rhenium CVD sheath (O.D. 1.1 mm). A protective $ReSi_2$ coating is applied. This protection withstands at least 1600°C, 45 minutes in steam. Tests are doneconcerning: a) materials compatibilities in helium between 1400°C and 2000°C, b) prototypes qualification (in Saclay or Grenoble), c) determination of errors due to degradation of insulation resistance of thermocouples cables (with magnesia, hafnia, alumina), d) Ir or Re protective coatings by CVD process, other coatings by ionic bombardment, etc... A completely new type of hot junction has been patented. Future works will include: completion of these tests, Mo-Nb alloys thermocouples legs realization withstanding heavy neutronic fluence, and use of ceramics glues.

39186 (INIS-BR—260, pp 258-271) **Development and test of the ZELT-3D computer code for unfolding power distributions using side reflector instrumentation signals.** Knob, P.J. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The impossibility of using internal instrumentation in high temperature reactor with spherical fuel, lead to the development of an instrumentation system that will be able to monitor power perturbations only using detectors located in the reflectors. This instrumentation is divided in three parts: one for each reflector, higher, lower and lateral. The development of a system located in the lateral reflector is shown. The system was tested for Kahter from IRE-KFA of very low dimensions and for the PNP-300 power reactor of very large dimensions. Good results were obtained.

39187 (INIS-mf—9532, pp 62-65) **Conceptual design considerations for the dry cooling system of Israel's nuclear project.** Mozes, E. (Israel Electric Corp. Ltd., Haifa). 1983. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780892. (CONF-831241—Summ.).

From Joint US/Israeli meeting on safety and siting problems for power reactors in a small country; Haifa, Israel (20 Dec 1983).

Published in summary form only.

39188 **Predictions of displacements and stresses in cracked reinforced concrete containment vessels subjected to seismic loads.** Conley, C. (Sandia National Labs., Albuquerque, NM (USA)); White, R.N. (Cornell Univ., Ithaca, NY (USA)). *Nuclear Engineering and Design;* **79**: No. 2, 175-185(May 1984). (CONF-830805—).

From 7. international conference on structural mechanics in reactor technology; Chicago, IL, USA (22 Aug 1983).

A three dimensional, nonlinear finite element analysis capability for analysis of cracked reinforced concrete nuclear containment vessel is described. A bilinear shear stress-shear strain model, based on experiments, is used to study the distribution of radial and tangential shear produced by horizontal seismic loading. Results show substantial redistribution of tangential shear, and significant increases in radial shear, peak bending stress, and vessel displacement, as compared to conventional linear analysis results.

39189 **Steel containment buckling research program.** Bennett, J.G. (Los Alamos National Lab., NM (USA)); Browzin, B.S.; Burns, J.J. (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Regulatory Research). *Nuclear Engineering and Design;* **79**: No. 2, 199-202(May 1984). (CONF-830805—).

From 7. international conference on structural mechanics in reactor technology; Chicago, IL, USA (22 Aug 1983).

An outline and the status of the NRC research program with the Los Alamos National Laboratory is presented.

39190 Pneumatic pressure tests of steel containment models - recent developments. Blejwas, T.E.; Von Riesemann, W.A. (Sandia National Labs., Albuquerque, NM (USA). Containment Integrity Div.). *Nuclear Engineering and Design;* **79**: No. 2, 203-209(May 1984). (CONF-830805—).

From 7. international conference on structural mechanics in reactor technology; Chicago, IL, USA (22 Aug 1983).

This paper describes the results of recent pneumatic pressure tests of steel containment models. These tests are part of the Containment Integrity Program whose objective is the qualification of methods for predicting containment response during severe accidents and extreme environments. Sandia National Laboratories is conducting this combined experimental and analytical program for the U.S. Nuclear Regulatory Commission (NRC). The long-range plans for the program include the following three containment loading conditions: static internal pressurization, dynamic internal pressurization, and seismic loadings. Steel, reinforced concrete, and prestressed concrete containment types are being considered. In the present experimental effort, models of steel containment structures are being subjected to static internal pressurization. The first set of models are about 1/32 the size of hybrid-steel containments. Tests of these models are nearly finished. Testing of a large steel model, about 1/8 of full size, will complete the static pressure experiments with steel models. Analysis of the models is paralleling the experimental effort. The Containment Integrity Program is being coordinated with other NRC programs on potential leakage of penetrations in containments. The results from all of the programs should provide a basis for predicting the structural and leakage behavior of containments during temperature and internal pressure loadings.

39191 Experimental investigation of the buckling of nuclear containment-like cylindrical geometries under combined shear and bending. Baker, W.E.; Bennett, J.G. (Los Alamos National Lab., NM (USA)). *Nuclear Engineering and Design;* **79**: No. 2, 211-216(May 1984). (CONF-830805—).

From 7. international conference on structural mechanics in reactor technology; Chicago, IL, USA (22 Aug 1983).

This paper describes the method for and results of, determining the static buckling interaction curves for both ring-stiffened and unstiffened cylindrical geometries that have radius-to-thickness (R/t) ratios and other parameters characteristic of nuclear steel containments. The purpose of developing these test methods and interaction curves is to have this information available for a dynamic buckling study on the same or similar shells that will be directed at answering questions regarding the freezing-in-time analysis method.

2203 Fuel Elements

REFER ALSO TO CITATION(S) 39755

39192 (INIS-BR—259) Thermal behavior simulation of a nuclear fuel rod through an electrically heated rod. Lima, R.deC.F. de. (Pernambuco Univ., Recife (Brazil). Dept. de Energia Nuclear). 1984. 175p. (In Portuguese). NTIS (US Sales Only), PC A08/MF A01. File Number DE85781435.

In thermalhydraulic loops the nuclear industry often uses electrically heated rods to simulate power transients, which occur in nuclear fuel rods. The development and design of a electrically heated rod, by supplying the dimensions and materials which should be used in order to yield the same temperature and heat flux at the surfaces of the nuclear rod and the electrically heated rod are presented. To a given nuclear transient this equality was obtained by fitting the linear power through the lumped parameters technique.

39193 (INIS-BR—260, pp 313-330) **Temperature distribution in cylindrical fuel rods - A variational treatment.** Araujo, L.R.A. de; Carmo, E.G.D. do; Roberty, N.C. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The radial heat conduction equation for a fuel rod transversal section is solved, considering the rod-cladding coupling. For the transient analysis, the differential equations for the two regions, rod and cladding, are approximated for each time element by non linear ordinary differential equations and non-homogeneous. In this time elements, the problem can be linearized and decoupled, taking materials properties and delayed interface conditions. A variational formulation for the linearized problem is done, and the Ritz method is used. A careful base choice is done, aiming to avoid numerical instabilities in the Ritz process and to obtain stable numerical solutions and solve the system by iteraction. The updating of this material properties are done by an external iterative algorithm that solves the Ritz system. This methdology is applied to each time element. The utilization of a global base gives a semi-analytical solution in an eight-function series form.

39194 (INIS-mf—9301) Integral description of the operational behaviour of fuel rods in thermal reactors. Wiesenack, W. (Hannover Univ. (Germany, F.R.). Fakultaet fuer Maschinenwesen). 10 Jun 1983. 145p. (In German). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781345.

This is the development of a concept of a comprehensive fuel rod programme which, maintaining the principle of the axisymmetric description of fuel and cladding, easy and fast for calculations, allows for exceptions to the ideal concentric disposition of the pellets within the cladding tube to be included. The chapter on thermodynamics deals with the calculation of fuel temperatures. Unlike conventional approaches with concentrically placed pellets, the average effects of cracks in the fuel as well as excentric positions of pellets are integrated in a model. A subsequent study investigates an uncertainties with respect to materials data and model assumptions concerning their effect on the calculation of temperatures. The chaper on mechanics deals with the fundamentals of the description of fuel and cladding. For both components, axisymmetry and plain strain are taken for granted. As an option, simplified models are available for fuel and cladding. Axial coupling of the forces arising between fuel and cladding takes into account various marginal conditions in axial and radial direction. As a special case, the random stacking interaction with simultaneous or dial and axial sliding of excentrically positioned pellets is closely examined. The comparison with measured values from the OECD Halden Reactor Project revealed that for the explanation of the thermomechanical behaviour the parameters excentricity, contact pressure and lateral deformation owing to axial forces play an important role. In conclusion it is shown that peculiarities of the mechanical and thermodynamic behaviour in subsequent load cycles can be explained by common assumptions.

39195 (SAAS—318) Theoretical studies on fission-product migration in nuclear fuel. Schreiber, H.J. (Staatliches Amt fuer Atomsicherheit und Strahlenschutz, Berlin (German Democratic Republic)). 1984. 42p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701650.

Based on the diffusion theory, the out-of-pile fission gas migration through low burn-up nuclear fuel has been examined mathematically for simplified geometrical conditions. The calculated data on concentration distributions and particle flows are thought to be useful in determining experimental conditions of future diffusion experiments.

2204 Control Systems

REFER ALSO TO CITATION(S) 39318, 39321, 39322, 39329, 39343

39196 (INIS-BR—260, pp 216-229) **Feedback static model for neutronic and thermalhydraulic simulation of fast reactors.** Waintraub, M.; Jachic, J. (Instituto de Engenharia Nuclear, Rio de Janeiro (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

From the simplified model of the reference state of the Super Phenix, the feedback process to correct the microscopic

cross sections with the reactor state is analyzed. Two dominant terms are considered in this process: the Doppler effect and the spectral effect. Spatial and cellulars calculations with 1DX and Hetaire code, aiming to determine the coefficients of Doppler effect and Spectral C_1 e C_2, respectivity. It was verified that the spectral contribution in the variation of the cross sections with the temperature is 12%, that means a great contamination in the Doppler effect.

39197 (INIS-mf—9479, pp 33-45) **Human factors engineering evaluation of an advanced control room.** Okamoto, M. (Kansai Electric Power Co., Inc., Osaka (Japan)); Ogura, N. (Hokkaido Electric Power Co. Inc., Sapporo (Japan)); Nagano, N. (Shikoku Electric Power Co. Ltd., Takamatsu (Japan)); Maeoka, M. (Kyushu Electric Power Co., Inc., Fukuoka (Japan)); Kato, S. (Japan Atomic Power Co., Tokyo); Tani, M. (Mitsubishi Heavy Industries Ltd., Tokyo (Japan)); Masuda, Y. (Mitsubishi Electric Corp., Kobe (Japan). Kobe Works); Takahashi, K. (Mitsubishi Atomic Power Industries, Inc., Tokyo (Japan)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

With full realization of the importance of improving the man-machine interface design in nuclear power plants, an extensive effort was made as a PWR-utilities-Mitsubishi joint project to develop a computer-based advanced control room (ACR) for PWR. After the completion of ACR conceptual design, the human engineering is coordinated to the design of control panel and CRT display system positively and the evaluation from the human engineering stand point is performed by human engineering specialists. This process consists of the following steps: the establishment of a human engineering guidelines, evaluation from human engineering stand point and dynamic evaluation.

39198 (INIS-mf—9479, pp 111-121) **Structures and scan strategies of software net models.** Puhr-Westerheide, P.; Sandbaek, H. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Garching (Germany, F.R.)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

The present paper deals with some aspects of plant control and monitoring systems as used in nuclear power plants. These aspects concern executable net models to run on computers. A short survey on the nets' environment and on some net scan strategies is given. Among the strategies are the 'topologically ordered scan' and the 'signal propagation scan'. A combined method 'topologically ordered signal propagation (TOSIP) scan' will be outlined as well as a net model data structure that allows the definition of subsystems for the use of clear structuration and dischargement to distributed systems.

39199 (INIS-mf—9479, pp 193-202) **Experiences of computer systems in instrumentation and control of a BWR power plant.** Haell, L.E. (Nokia Electronics, Helsinki (Finland)); Lucander, A. (Teollisuuden Voima Oy (Finland)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

The utilization and experiences of computer systems at the TVO Olkiluoto BWR power plant are summarized. The plant has been operating for several years and is equipped with modern advanced computer systems. The role of the computer is to collect, process and display information to the operators and to the maintenance and the technical staff. The questions of how to maintain, what a reasonable development activity level is, and when the replacement of the computer systems is necessary are also discussed.

39200 (INIS-mf—9479, pp 203-212) **Man-machine communication improvements in Computerized Operator Support System by new technologies.** Tai, I.; Seki, E.; Fukumoto, A. (Toshiba Corp., Kawasaki, Kanagawa (Japan)); Mori, N. (Toshibe Corp., Tokyo (Japan). Principal Office); Tsuchida, M. (Toshiba Corp., Fuchu (Japan). Fuchu Works); Itoh, J.; Tanaka, K. (Nippon Atomic Industry Group Co. Ltd., Kawasaki, Kanagawa. Nuclear Research Lab.). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

Improvement of the man-machine interface performance is under way as Computerized Operator Support System for nuclear power plants in Japan. This paper describes several improved points in the design of man-mashine interface, especially on the console, based on the evaluation of the conventional design and by taking into account the performance test results of new man-machine interfacing tools.

39201 (INIS-mf—9479, pp 213-226) **Man-machine communication at Forsmark 3.** Hultquist, G. (Statens Vattenfallsverk, Stockholm (Sweden)); Norberg, S. (ASEA-ATOM AB, Vaesteraas (Sweden)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

The design of Forsmark 3 began in 1976 and the control room layout and equipment were discussed right from the start. Susequent evolution and events in other nuclear power plants have, however, radically changed the direction of the development of the man-machine functions.

39202 (INIS-mf—9479, pp 227-235) **Plant computer man-machine communication at Forsmark 3.** Pilling, J. (ASEA-ATOM AB, Vaesteraas (Sweden)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

The Plant Computer System described in this presentation has been delivered by ASEA Atom for the Forsmark 3 nuclear power station. It will provide a comprehensive picture of plant status to the operating crew, carrying out a number of important supervision and control functions. A short description of each functions is followed by an outline of the hardware configurations. A number of displays are shown to illustrate the operator dialogue for access to the main functions.

39203 (INIS-mf—9479, pp 237-246) **Use of computers for operator information systems and controls in Indian nuclear power plants.** Surendar, Ch.; Natarajan, K.; Ahmad, S.N.; Dixit, P.C. (Department of Atomic Energy, Bombay (India). Power Projects Engineering Div.). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

There has been a gradual increase in the application of computers for on-line status monitoring, analysis and control in Indian nuclear power plants. This paper describes the design features, present status and future designs being planned, the operator information and control systems provided in the Rajasthan and Madras nuclear power plants. It also describes the computer-based data acquisition system with color graphic CRT displays and hard copy facilities, planned for the Narora nuclear power project.

39204 (INIS-mf—9479, pp 247-256) **Methods and techniques used in computerized operator support systems for German NPPs.** Roggenbauer, H. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Garching (Germany, F.R.)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

The main purpose of this paper is to give a survey about those functions in German (FRG) nuclear power plants which are already covered by computers or will be covered in the future. Thereby those systems covering the most important functions are described. The methods of new techniques applied in these systems are explained. Special requirements based on the outcome of the operator task analysis, and also on operational and safety demands to be put on these operator support systems are indicated.

39205 (INIS-mf—9479, pp 259-272) **Computerized operator support system for BWR power plant during normal and abnormal conditions.** Monta, K.; Sato, N.; Tsunoyama, S.; Sekimizu, K. (Nippon Atomic Industry Group Co. Ltd., Kawasaki, Kanagawa. Nuclear Research Lab.); Mori, N. (Toshibe Corp., Tokyo (Japan). Principal Office). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

A computerized operator support system for BWR was developed based on the operators tasks which are divided into problem solving and controlling. Problem solving comprises fault managing and planning tasks. One of the operator supports for the problem solving is the automatic diagnostic support. However, the operator supports for controlling tasks are still important, e.g. to support its rule memory and rule execution. In the system presented here, operator supports are considered for both of these two categories. In the paper two subsystems for the latter are mainly described.

39206 (INIS-mf—9479, pp 273-278) **Microcomputer-based real time information system for WWER-400 reactor.** Avramov, I.; Dimitrov, V. (Bulgarian Academy of Sciences, Sofia (Bulgaria). Central Lab. for Automation and Scientific Instrumentation). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

The goals, architecture and functioning of a microcomputer-based information system for WWER-440 nuclear reactors are discussed. The system registrates a great number of technological parameters and defines the temperature, hydraulic and technic-economic characteristics of the reactor. The calculation, registation and visualization of these parameters in real time increase the quality of reactor exploitation and facilitate the operators' work.

39207 (INIS-mf—9640) **CANDU 600 primary heat transport system thermalhydraulic commissioning.** Brimley, W.J.G.; Garland, W.J.; Jackson, G.W. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. CANDU Operations). May 1983. 14p. (CONF-8305259—9). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781424.

From Canadian Nuclear Society commissioning symposium; Toronto, Ontario, Canada (3 May 1983).

In this paper, the Primary Heat Transport System thermalhydraulic commissioning program and related computer code tuning for CANDU 600's is reviewed. This entails using the site data gathered during commissioning to 'tune' or 'lock-on' large predictive computer codes. Such tuning enables these codes to become site-specific codes, to allow more accurate predictions of the primary and some secondary side system performance. The overall methodology of the program, concentrating on a rational and systematic procedure for code tuning, is described. The reactor instrumentation, data aquisition systems, and the data analyses programs are reviewed. Developments in tuning the steady-state code NUCIRC and the transient code SOPHT are also presented. Finally, a summary of the results of this program to date and its usefulness to channel flow verification, critical channel power and regional over-power trip setpoints, stability commissioning, and reactor power calibration is noted.

39208 (INIS-mf—9642) **Development of symptoms-oriented operating procedures.** Colquhoun, R. (Canatom Ltd., Montreal, Quebec (Canada)). Apr 1983. 23p. (CONF-8305259—11). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781426.

From Canadian Nuclear Society commissioning symposium; Toronto, Ontario, Canada (3 May 1983).

Until recently the formal treatment of control room procedures for nuclear power plant upset conditions has been event-oriented. The demise of Three Mile Island, Unit 2, caused the American industry to recognize the pitfalls inherent in relying totally on event-oriented procedures, and led to the initiation of a program for the development of a symptoms-oriented approach for handling upset conditions. The U.S. program has been independently paralleled by a Canadian program. This paper describes the development of the Canadian symptoms-oriented philosophy and identifies the relevance of a generic symptoms based emergency procedure to current operating practices.

39209 (JINR—D-13-84-53, pp 160-165) **CAMAC devices for automatization in investigations of reactors and accelerators.** Brovchenko, V.G.; Zhukov, V.A.; Karzhavin, Yu.A.; Malashinin, I.I.; Mosejko, N.I.; Polyakov, I.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

A computerized system of scientific investigations of collective usage consisting of a central computer complex and peripheral computer complexes at a research reactor, cyclotron, tocamac etc is developed. The system is based on the CAMAC equipment. The modular structure comprises system modules and those for spectrometry of ionizing radiations, measuring of low currents and voltages, analog-to-digital converters, storage modules, counter channels. The circuits of computerized systems for measuring of nuclear reactor parameters are presented.

39210 (JINR—D-13-84-53, pp 381-385) **Spectrometers for nuclear reactors and NPP.** Kurochkin, S.S. (Soyuznyj Nauchno-Issledovatel'skij Inst. Priborostroeniya, Moscow (USSR)). 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

Basic characteristics and experience in spectrometers using as well as the basic application of the spectrometers at NPPRs are briefly considered. The most widely spread for controlling technological media and fuel elements are GeLi(Tl) semiconductor γ-spectrometer for controlling environment samples- GeLi (Tl)+NaI(Tl) highly effective spectrometers as well as NaI(Tl) low-background spectrometers of human radiations. Portable spectrometers and multichannel analyzers are applied for in situ measurements. The software of spectrometric systems which comprise mini- or microcomputers usually is organized on the base of firm operation real time systems.

39211 (NUREG/CR—4298) **Design and installation of computer systems to meet the requirements of 10 CFR 73.55.** Lewis, J.R.; Byers, K.R.; Fluckiger, J.D.; McBride, K.C.; Vickroy, S.C. (Pacific Northwest Labs., Richland, WA (USA)). Jul 1985. Contract AC06-76RL01830. 196p. (PNL—5490). NTIS, PC A09/MF A01 - GPO. File Number TI85015255.

The Pacific Northwest Laboratory has studied the design and installation of computer-managed systems that can help nuclear power plant licensees to meet the physical security requirements of 10 CFR 73.55 (for access control, alarm monitoring, and alarm re-

cording). Two objectives were to study the power plant security functions that could be aided by a computer-managed physical security system and to evaluate the safety and security considerations of such a system. A further objective was to develop guidance on system design, selection, and installation. The design guidance includes safety and security requirements, design alternatives, computer security, workspace design, and user interface design. Guidance is also provided on writing a system specification for procurement, bid review procedures, and site preparation. 52 refs.

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 39363, 40139

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 39258, 39259, 39260, 39262, 39263, 39265, 39270, 39277, 39278, 39279, 39280, 39281, 39282, 39283, 39284, 39304, 39305, 39308, 39310

39212 **(EGG/LTR—20-101) LOFT steam generator simulator and pump simulator performance during LOFT isothermal test Series L1.** Jacoby, M.S.; Prassinos, P.G. (EG and G Idaho, Inc., Idaho Falls (USA)). 3 May 1979. Contract AC07-76ID01570. 60p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85015873.

The Loss-of-Fluid Test (LOFT) facility simulates the thermal-hydraulic conditions typical of a large pressurized water reactor (PWR) and is designed to provide data from loss-of-coolant experiments (LOCE). Isothermal Test Series L1 was performed in LOFT with a steam generator simulator and pump simulator in the broken loop hot leg for Tests L1-2 through L1-5 and in the broken loop cold leg for Test L1-1. This report examines the performance of the steam generator simulator and pump simulator during LOFT isothermal Test Series L1 and is an extension of the work reported in LTR 20-14. The evaluation of the component simulators was performed using the RELAP4/MOD5 computer code, and using the results from this evaluation, an assessment of RELAP4/MOD5 was also performed.

39213 **(EGG/LTR—112-141) LOFT blowdown suppression spray system response time.** Kuehster, C.J. (EG and G Idaho, Inc., Idaho Falls (USA)). 8 Jun 1978. Contract AC07-76ID01570. 24p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015451.

The LOFT Blowdown Suppression Tank Instrumentation Modification consisted of relocating three valves from directly above the tank to outside the BST shielding. This modification created longer runs from the valves to the tank's spray nozzles, altering the response times of the nozzles following valve initiation. The spray nozzle response times were calculated and are satisfactory for the system.

39214 **(EGG/LTR—114-96) LOFT CIS analysis 1/2 in.-PCS-11-VA outside penetration S-5B.** Condie, C.G. (EG and G Idaho, Inc., Idaho Falls (USA)). 13 Jul 1978. Contract AC07-76ID01570. 58p. (RE-A—78-062). NTIS, PC A04. File Number DE85015441.

Line 1/2 in.-PCS-11-VA outside the LOFT containment penetration S-5B was analyzed to ASME Code, Subsection NC (Class 2) criteria. This piping is part of the Containment Isolation System. The model considered the piping from the penetration through one isolation valve and to the first wall through which the line passes. Results of this analysis show that this section of the line will meet Class 2 requirements without modification.

39215 **(EGG/LTR—115-30-App.I) Secondary coolant system condensate receiver calculations. Appendix I.** Stevenson, D.H. (EG and G Idaho, Inc., Idaho Falls (USA)). 9 May 1978. Contract AC07-76ID01570. 8p. NTIS MF A01; 2; GPO Dep. File Number DE85015445.

This LTR includes the basic design calculations for condensate receiver SC-T-6. The current specification reflects a design based upon an outside diameter of 54 in. and a length of 24.41 ft. This document was originally Appendix I to LOFT SDD 1.1.5B.

39216 **(EGG/LTR—121-3) Design calculations for Sump Sampling System.** Maringas, N. (EG and G Idaho, Inc., Idaho Falls (USA)). 10 Mar 1978. Contract AC07-76ID01570. 16p. NTIS, PC A02. File Number DE85015430.

This LTR contains the original design calculations for line and head losses in the Sump Sampling System at different flow rates. This LTR is being released for Record Purposes to retain design calculations.

39217 **(EGG/LTR—1217-2) Thermal analysis of LOFT containment vessel penetrations S-5E and S-6A.** Condie, K.G. (EG and G Idaho, Inc., Idaho Falls (USA)). 21 Apr 1970. Contract AC07-76ID01570. 65p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85015456.

Thermal analysis of the LOFT containment vessel penetration S-6A was conducted for steady-state operation and blowdown transients. Penetration S-6A is a 20-inch pipe through which passes a 10-inch pipe from the steam generator containing 600°F steam. Recommendations for penetration S-5E were based on the analysis of penetration S-6A. Penetration S-5E is an 18-inch pipe through which pass a 4-inch pipe containing the steam generator feedwater at 430°F and a 0.5-inch pipe containing sample water at 600°F. The thermal analysis is necessary to determine the maximum temperature gradient in the containment vessel around the penetrations. The outside of the penetrations protrude into a room adjacent to the containment vessel which will be maintained at a minimum temperature of 50°F. The steady-state temperature inside the containment vessel was assumed to be 100°F. Table I of LOFT Containment Vessel Specification S-1 was used for inside transient temperatures.

39218 **(EGG/LTR—1310-33) LOFT Vital MG Set transient parameter review.** Kranning, A.N. (EG and G Idaho, Inc., Idaho Falls (USA)). 12 Sep 1978. Contract AC07-76ID01570. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015464.

This report evaluates the performance of the vital MG sets during a worst case load transfer. Evaluation of test data showed: (1) The Vital MG Set withstood the extreme loading; (2) The load can be sustained well in excess of the required time limit; and (3) The transfer perturbation caused the frequency to exceed the limits set by the SDD. The follow up evaluations of the equipment powered by the MG sets demonstrated that the equipment function will not be degraded.

39219 **(EGG/LTR—1326-1) Kaiser Engineers Railroad Tractive Effort Test, LOFT - A and M track.** White, E.R. (EG and G Idaho, Inc., Idaho Falls (USA)). 9 May 1978. Contract AC07-76ID01570. 27p. NTIS, PC A03. File Number DE85015438.

This LTR contains the original results of the Railroad Locomotive Tractive Effort Test performed by Kaiser Engineers on July 29, 1965, using an existing 24-wheel 500-ton dolly and the existing shielded locomotive. The test was conducted to confirm calculations of the tractive effort required to move the LOFT dolly (MTA) through the four-rail high bay curve and the curve into the LOFT containment vessel.

39220 **(HEDL-SA—3274-S) Calculational tracking of decay heat for FFTF plant.** Cillan, T.F.; Carter, L.L. (Hanford Engineering Development Lab., Richland, WA (USA)). Jan 1985. Contract AC06-76FF02170. 7p. (CONF-850903—7). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013997.

From International topical meeting on computer applications for nuclear power plant operation and control; Pasco, WA, USA (8 Sep 1985).

A detailed calculational monitoring of decay heat for each assembly on the Fast Flux Test Facility (FFTF) plant is obtained by utilizing a decay heat data base and user friendly computer programs to access the data base. Output includes the time-dependent decay heat for an assembly or a specific set of assemblies, and optional information regarding the curies of activated nuclides along the axial length of the assembly. The decay heat data base is updat-

ed periodically, usually at the end of each irradiation cycle. 1 ref., 2 figs.

39221 **(HEDL-SA—3283-FP) Computer control of fuel handling activities at FFTF.** Romrell, D.M. (Hanford Engineering Development Lab., Richland, WA (USA)). Mar 1985. Contract AC06-76FF02170. 31p. (CONF-850903—5). NTIS, PC A03/MF A01; GPO Dep. File Number DE85008496.

From International topical meeting on computer applications for nuclear power plant operation and control; Pasco, WA, USA (8 Sep 1985).

The Fast Flux Test Facility near Richland, Washington, utilizes computer control for reactor refueling and other related core component handling and processing tasks. The computer controlled tasks described in this paper include core component transfers within the reactor vessel, core component transfers into and out of the reactor vessel, remote duct measurements of irradiated core components, remote duct cutting, and finally, transferring irradiated components out of the reactor containment building for off-site shipments or to long term storage. 3 refs., 16 figs.

39222 **(IDO—1570-T28) LOFT monthly progress report for September 1979.** (EG and G Idaho, Inc., Idaho Falls (USA)). Oct 1979. Contract AC07-76ID01570. 38p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015480.

In September, a baseline schedule was developed for FY-1980. That schedule, shown schematically in this report, calls for an ambitious test program involving small-break tests, anticipated transient tests, and a few large break tests. Not only are three test series involved, the pace has been set to provide tests at approximately ten-week intervals, with pairing of L6 and L3 tests. This plan will be extremely challenging because of the diversity and rate of plant and personnel preparation required and the frequency of data collection and evaluation. September marked the completion of FY-1979. Final closing values for each of the funding sources is shown. DOE-funded tasks closed right on budget. NRC- and foreign-funded tasks closed with underruns. The majority of these underruns stemmed from uncosted but incurred liabilities. Plant work in September continued at a pace to permit acceleration of test L3-1 into November. During September, the plant primary system was restored and the plant filled with water in preparation for cold and hot hydro-testing. 2 figs., 7 tabs.

39223 (INIS-BR—260, pp 18-32) **Study of the IPR-R1 dynamics by means of reactivity pseudo-aleatory excitations.** Roedel, G. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

Aiming to demonstrate the feasibility of using the reactor noise neutronic analysis techniques, a dynamic model was developed for the IPR-R1 reactor at CDTN. This model allows reactivity feedback, due to the variations of fuel and coolant temperature. The system was excited by the variations of reactivity modulated by a pseudo aleatory binary sequence and its answer was measured by means of the fluctuations around the stationary power. The model developed and the technique used was tested, and the values of the system parameters obtained from the adjustment of the theoretical and experimental transfer function were compared to another, obtained from independent process.

39224 (INIS-BR—260, pp 106-120) **Survey of the thermal and fast neutron flux distribution in the core of IPR-R1 reactor.** Guimaraes, R.R.R.; Santoro, C.A.B. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov,1983).

A methodology to obtain the neutron flux distribution inside the core is presented, aiming to analize the project of reactor increasing power. The technique of measures by activation with irradiation of steel eletrodes of 700 mm of lenght, put in acrylic rods was used. In the detection process and in the counting of activation product, a Ge (Li) detector with high resolution and a scanning mechanical system, constructed and projected in CDTN (Nuclear Technology Development Center) were used.

39225 (INIS-BR—260, pp 282-296) **Performance and management of IPR-R1 fuel elements.** Stasiulevicius, R.; Maretti Junior, F. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The performance of fuel elements during the 23 years of the reactor operation, is presented, aiming to introduce improvements in the fuel load distribution and consequent increase of the reactivity. A computer code CORE was developed aiming to calculate the individual burnup of the fuel elements and the value of the reactivity for several core configurations, establishing a routine to control the nuclear material in the IPR-R1. The values calculated were compared with the experimental results. Some alternatives to augment the reactivity of the present core are presented, foreseeing the fuel load availability for operation with 100 Kw and, for augmenting the power reactor in a next stage.

39226 (INIS-mf—9479, pp 49-59) **Systems for aiding operators at university-owned research reactors in Japan.** Nishihara, H.; Kimura, Y.; Shibata, T. (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.); Murata, Y.; Iijima, S. (Musashi Inst. of Tech., Tokyo (Japan)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

University-owned research reactors are operated for various purposes, and small disturbances may arise from various experimental facilities. Also not uniform are the technical levels of operators who range from supervised-students to reactor physicists. Considerable efforts are therefore devoted to the preventive maintainance. With these boundary conditions imposed, systems for aiding operators are designed at these research reactor facilities.

39227 (INIS-mf—9479, pp 61-69) **Disturbance analysis system SAAP-2.** Lindner, A.; Baldeweg, F.; Fiedler, U. (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

The real time diagnosis system SAAP-2 (Stoerungsanalyse Applikations-Programm) is described. This system is a part of the Hierarchical Information System (HIS) which is designed for the Rossendorf Research Reactor (RRR), GDR. SAAP-2 comprises the tasks of data acquisition and preprocessing, monitoring of disturbances, diagnosis and communication. It is based on a discrete model, an event graph G = (E, R, PHI), which represents events as nodes and technological relations as arcs. The system SAAP-2 is a dialogue oriented system.

39228 (INIS-mf—9532, pp 10-15) **Incorporating the operation of a small research reactor facility to support a national nuclear power program.** Levine, S.H. (Pennsylvania State Univ., University Park (USA)). 1983. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780892. (CONF-831241—Summ.).

From Joint US/Israeli meeting on safety and siting problems for power reactors in a small country; Haifa, Israel (20 Dec 1983).

Published in summary form only.

39229 (INIS-mf—9682) OECD Halden Reactor Project. 1958-1983. (Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt). 1983. 61p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781513.

The OECD Halden Reactor Project is both the oldest and the only one still in operation of the three major joint undertakings established at the inception of the OECD Nuclear Energy Agency. This publication has been printed in connection with its twenty-fifth anniversary as an international project. After presentation of the history and organization of the project, a thorough description of the past and present activities in the field of fuel performance and process control and surveillance is given. The projects's fuel testing programme is now focussed on an investigation to define safety margins under normal operations as well as under various kinds of accident situations. Fuel research is also concerned with the characterisation of long term effects with regard to efficiency, operational safety and mapping of reliability and durability in the case of accidents with loss of coolant. In the field of process control and surveillance, research work is directly linked to the use of computers and colour graphics as tools in the control room. A fullscale simulator-based model and experimental control room has been constructed. The first experiments to be carried out in this laboratory will investigate the advantage of analysing alarms before they are presented to the operator. (RF).

39230 (JAERI-M—83-211) Core design and critical experiment on FCA XI-1 Assembly. Osugi, Toshitaka; Mukaiyama, Takehiko; Okajima, Shigeaki; Koakutsu, Tatsuo; Sanda, Toshio; Yoshida, Hiroyuki. (Japan Atomic Energy Research Inst., Tokyo). Nov 1983. 81p. (In Japanese). NTIS (US Sales Only), PC A05/MF A01. File Number DE85701648.

A preanalysis was performed to investigate physical properties of a partial mock-up assembly for a conventional large fast reactor. The central region of the FCA XI-1 Assembly was designed to simulate the nuclear characteristics of the inner core of the large fast reactor based on the results from the preanalyses mentioned above. This report discusses the physical properties obtained from the preanalysis on the FCA XI-1 Assembly, and present the experimental results concerning the critical approach, the control rod calibration, the temperature effects and the gap effects.

39231 (JINR—D-13-84-53, pp 386-390) **Electronics systems for experimental reactor physics.** Racek, J.; Rumler, C.; Gregorova, E.; Osmera, B.; Turzik, Z.; Rypar, V.; Svoboda, C. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

Devices applied in zero power reactors for measuring physical characteristics are briefly described. They comprise one- and two-channel automatic systems for measuring sample activity on the basis of scintillation detectors. Inculded are: γ-activity measuring systems over fuel elements length, time analyser systems for measuring neutron noise, in-core fission ionization chamber, testing systems, multiplexer systems for in-reactor temperature measurements, neutron spectrometers and reactivity measuring systems. All systems are developed on the basis of CAMAC electronics.

39232 (LTR—115-9(Suppl.1)) High pressure relief valve quenching. Supplement 1. Swartzwelder, R.B. (EG and G Idaho, Inc., Idaho Falls (USA)). 29 Dec 1977. Contract AC07-76ID01570. 3p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015462.

In response to additional needs developed during a review of the LOFT Technical Specifications, two more pressure reduction and decontamination sump volume vs. initial temperature data points were calculated in order to adequately quench steam generator relief blowdown. The two additional points chosen were for 10,000 gallons (based on ECC requirements) and for 120°F (NPSH limit maximum temperature). The results are that for 10,000 gallons in the sump the maximum initial temperature is 110°F and for 120°F initial temperature, a volume of 14,000 gallons is required in the sump. Calculations are shown on page two of this report. The maximum final PR and DS temperature was set at 140°F to preclude the vibrational effects discussed in LTR 115-9 and its referenced operational experience reports.

39233 (UJV—6918-CH) Contribution to the investigation of problems concerning the cooling water of the research VVR-S reactor. Sara, V.; Listik, E.; Obrusnik, I.; Moravec, J.; Habersbergerova, A.; Peterka, F. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). Jun 1984. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701657.

Reactor cooling water was sampled in service and measured gamma spectrometrically. The results are tabulated. Spectral lines correspond to isotopes generated by the activation of corrosion products and to impurities from chemical water treatment (^{24}Na, ^{38}Cl). Infrared spectra were measured of a sample of the aqueous phase from the ion exchange purifier following filtration, irradiation with ^{60}Co, centrifugation and homogenization. Radiolysis of resin from the ion exchanger yields products forming a colloidal solution as a result of the reactions with impurities present in the cooling water.

2207 Plutonium And Isotope Production Reactors

REFER ALSO TO CITATION(S) 39370

39234 (INIS-BR—260, pp 169-178) **Thermal flux maximization in the central irradiation chamber of a radioisotope production reactor.** Assis, J.T. de (Instituto de Engenharia Nuclear, Rio de Janeiro (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

Using a methodology of optimization, for an one-dimensional model for two-energy group, best values related to the project data were calculated, for the step and fuel enrichment, that maximize the thermal flux in the central irradiation chamber of the Radioisotope Production Reactor (RPR). The temperature values in the medium channel and hot channel for the same rate of flow are presented.

39235 (INIS-BR—260, pp 246-257) **Optimization of some parameters of the radioisotope production reactor (RPR) model.** Silva, L.C.R.M. da; Jachic, J. (Instituto de Engenharia Nuclear, Rio de Janeiro (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

Using a RPR simplified model and considering the geometrical, neutronic, thermalhydraulic and metalurgical limitations of the project, improved values were calculated, for the step and diameter of the fuel rod, which minimize the coolant flow velocity. The improved solution showed that the velocity can be diminuished in 11% if increase the step in 3.15% and diminuish the diameter in 0.18%. The problem was extended to fuel enrichment values and reactor core radii that maximize the thermal flux in the central irradiation chamber.

39236 (UNI-SA—143) Vibration monitoring of large vertical pumps via a remote satellite station. Cook, S.A.; Crowe, R.D.; Roblyer, S.P.; Toffer, H. (UNC Nuclear Industries, Inc., Richland, WA (USA)). 21 Mar 1985. Contract AC06-76RL01857. 10p. (CONF-850926—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE85011701.

From ASME vibration and sound conference; Cincinnati, OH, USA (10 Sep 1985).

The Hanford N Reactor is operated by UNC Nuclear Industries for the Department of Energy for the production of special isotopes and electric energy. The reactor has a unique design in which the equipment such as pumps, turbines, generators and diesel engines are located in separate buildings. This equipment arrangement has led to the conclusion that the most cost-effective implementation of a dedicated vibration monitoring system would be to install a computerized network system in lieu of a single analyzing

station. In this approach, semi-autonomous micro processor based data collection stations referred to as satellite stations are located near each concentration of machinery to be monitored. The satellite stations provide near continuous monitoring of the machinery. They are linked to a minicomputer using voice grade telephone circuits and hardware and software specifically designed for network communications. The communications link between the satellite stations and the minicomputer permits data and programs to be transmitted between the units. This paper will describe the satellite station associated with large vertical pumps vibration monitoring. The reactor has four of these pumps to supply tertiary cooling to reactor systems. 4 figs.

39237 **(UNI-SA—144) Hardware and software constructs for a vibration analysis network.** Cook, S.A.; Crowe, R.D.; Toffer, H. (UNC Nuclear Industries, Inc., Richland, WA (USA)). 20 Feb 1985. Contract AC06-76RL01857. 10p. (CONF-850903—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE85008436.

From International topical meeting on computer applications for nuclear power plant operation and control; Pasco, WA, USA (8 Sep 1985).

Vibration level monitoring and analysis has been initiated at N Reactor, the dual purpose reactor operated at Hanford, Washington by UNC Nuclear Industries (UNC) for the Department of Energy (DOE). The machinery to be monitored was located in several buildings scattered over the plant site, necessitating an approach using satellite stations to collect, monitor and temporarily store data. The satellite stations are, in turn, linked to a centralized processing computer for further analysis. The advantages of a networked data analysis system are discussed in this paper along with the hardware and software required to implement such a system.

2209 Reactor Safety

REFER ALSO TO CITATION(S) 39146, 39160, 39217, 39222, 39608, 39616, 41081

39238 **(AECL—7080) Research and development into power reactor fuel performance.** Notley, M.J.F. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Jul 1983. 32p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701654.

The nuclear fuel in a power reactor must perform reliably during normal operation, and the consequences of abnormal events must be researched and assessed. The present highly reliable operation of the natural UO_2 in the CANDU power reactors has reduced the need for further work in this area; however a core of expertise must be retained for purposes such as training of new staff, retaining the capability of reacting to unforeseen circumstances, and participating in the commercial development of new ideas. The assessment of fuel performance during accidents requires research into many aspects of materials, fuel and fission product behaviour, and the consolidation of that knowledge into computer codes used to evaluate the consequences of any particular accident. This work is growing in scope, much is known from out-reactor work at temperatures up to about 1500 degrees C, but the need for in-reactor verification and investigation of higher-temperature accidents has necessitated the construction of a major new in-reactor test loop and the initiation of the associated out-reactor support programs. Since many of the programs on normal and accident-related performance are generic in nature, they will be applicable to advanced fuel cycles. Work will therefore be gradually transferred from the present, committed power reactor system to support the next generation of thorium-based reactor cycles.

39239 **(AIF/NESP—031ER) Planning concepts and decision criteria for sheltering and evacuation in a nuclear power plant emergency. Executive report.** Lindell, M.K.; Bolton, P.A.; Perry, R.W.; Stoetzel, G.A.; Martin, J.B.; Flynn, C.B. (Battelle Human Affairs Research Center, Seattle, WA (USA); Pacific Northwest Labs., Richland, WA (USA); Social Impact Research, Inc., Seattle, WA (USA)). Jun 1985. Contract AC06-76RL01830. 66p. Atomic Industrial Forum, Inc., 7101 Wisconsin Ave., Bethesda, MD 20814-4805. File Number TI85014684.

This report reviews the major planning concepts and decision criteria that should be considered in preparing for and selecting appropriate protective actions in the event of a nuclear power plant accident. The document can serve as an aid to all emergency planners, since it provides concepts and criteria to be considered in both radiological and nonradiological emergencies. The report is divided into two parts, the first of which consists of a two chapter overview of protective action decisionmaking. The introductory chapter begins with an analysis of the decision environment surrounding the selection of appropriate protective actions for offsite residents in the event of a nuclear power plant emergency. The second chapter presents decision aids that describe the major planning concepts and decision criteria for sheltering and evacuation.

39240 **(BMI—1985-066) Removal of airborne particulate radioactivity under accident conditions.** Ruedinger, V.; Wilhelm, J.G. (Bundesministerium des Innern, Bonn (Germany, F.R.); Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). Mar 1985. 121p. NTIS (US Sales Only), PC A06/MF A01. File Number DE85752005.

In the case of an accident, the filter elements in the ventilation systems of a nuclear facility may become a part of the remaining fission product barrier. Within the framework of the Project Nuclear Safety of the Karlsruhe Nuclear Research Center, contributions are made to an increase in reliability of the air cleaning systems under accident conditions. These include the development and verification of computer programs for the estimation of those conditions prevailing inside the air cleaning systems in the case of an accident. Experimental investigations into the response of HEPA filters to differential pressures involving both dry and moist air have demonstrated the occurence of structural failures with subsequent loss of efficiency at relatively low values of differential pressures. With regard to further investigations, a new test facility was put into operation for the realization of superimposed challenges. A new method for testing particulate removal efficiency under high temperature or high humidity was developed. Finally, first results of code development work and of the corresponding verification experiments are reported on.

39241 **(BNL-NUREG—35944) Analytical modeling techniques for efficient heat transfer simulation in nuclear power plant transients.** Wulff, W.; Cheng, H.S.; Mallen, A.N. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 28p. (CONF-850810—13). NTIS, PC A03/MF A01 - GPO. File Number TI85008293.

From National heat transfer conference; Denver, CO, USA (4 Aug 1985).

New integral methods are formulated which are suitable for efficient computer simulation of thermal conduction and convective heat transfer in large engineering systems such as nuclear power plants. The methods described here have been shown to produce, in a special-purpose minicomputer for complex system simulations, extremely high simulation speed and accuracy which is commensurate with that of instrumentation. 11 refs., 3 figs.

39242 **(BNL-NUREG—36337) Probability based load factors for design of concrete containment structures.** Hwang, H.; Kagami, S.; Reich, M.; Ellingwood, B.; Shinozuka, M. (Brookhaven National Lab., Upton, NY (USA); National Bureau of Standards, Washington, DC (USA). Center for Building Technology; Columbia Univ., New York (USA). Dept. of Civil Engineering and Engineering Mechanics). 1985. Contract AC02-76CH00016. 7p. (CONF-850809—67). NTIS, PC A02/MF A01 - GPO. File Number TI85012507.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

This paper describes a procedure for developing probability-based load combinations for the design of concrete containments. The proposed criteria are in a load and resistance factor design (LRFD) format. The load factors and resistance factors are derived for use in limit states design and are based on a target limit state probability. In this paper, the load factors for accident pressure and safe shutdown earthquake are derived for three target limit state probabilities. Other load factors are recommended on the basis of prior experience with probability-based design criteria for ordinary building construction. 6 refs.

39243 **(BNL-NUREG—36342) Correlation of Fukushima data with SSI models.** Miller, C.A.; Costantino, C.J.; Philippacopoulos, A.J. (Brookhaven National Lab., Upton, NY (USA); City Univ. of New York, NY (USA)). 1985. Contract AC02-76CH00016. 9p. (CONF-850809—61). NTIS, PC A02/MF A01 - GPO. File Number TI85011827.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

The seismic response of nuclear power plant structures is often calculated using lumped parameter methods. A finite element model of the structure is coupled to the soil with a spring-dashpot system used to represent the interaction process. The parameters of the interaction model are based on analytic solutions to simple problems which are idealizations of the actual problem. The objective of this work is to compare predicted responses using the standard lumped parameter models with experimental data. Comparisons are made between response predictions based on lumped parameter models and measured data at the Fukushima Reactor Containment Building during a moderately large earthquake. These comparisons are shown to be good for fairly uniform soil systems. 6 refs., 4 figs.

39244 **(BNL-NUREG—36470) Alternate procedures for the seismic analysis of multiply supported piping systems.** Subudhi, M.; Bezler, P. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 11p. (CONF-850809—71). NTIS, PC A02/MF A01 - GPO. File Number TI85014187.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

The seismic design of secondary systems such as piping requires knowledge of the motions at various locations of the primary structures. When the structure or buildings are subjected to earthquake-like excitations at the ground level, the responses at different floor levels may be quite different from each other. This difference depends on the building and soil frequency characteristics, the characteristics of the input signals, the damping levels, and soil-structure interaction effects. When multiple independent excitations are considered in the analysis of piping systems, the responses can be considered to have two distinct components. One is due to the inertia of masses alone (dynamic component) and the other is due to the time varying differential motion of the support points (pseudo-static component). To address this problem, a sample of six piping systems, two of which were subjected to thirty-three earthquakes, were studied to develop a statistical assessment of different methods of predicting the dynamic, pseudo-static and combined response. Both uniform and independent support motion methods were considered. The results are obtained in tabular form. The mean and standard deviation for the two piping systems subjected to thirty-three earthquakes were obtained to allow an assessment of the adequacy and level of conservatism associated with each method. These results are also displayed in graphical form for selected, critical locations in the piping systems. The limitations of each method and recommendations are discussed.

39245 **(BNL-NUREG—36473) Procedure for determining the SSE response from the OBE response.** Curreri, J. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 7p. (CONF-850809—70). NTIS, PC A02/MF A01 - GPO. File Number TI85014211.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

Regulatory Guide 1.61 specifies the damping that should be used for all modes that are considered in an elastic spectral or time history dynamic seismic analysis of Seismic Category I components. Table 1 of R.G 1.61 specifies damping values for dynamic analysis for two different earthquakes, the Safe Shutdown Earthquake and the Operating Basis Earthquake. The guide specifies that "...if the maximum stresses due to static, seismic and other dynamic loading are significantly lower than the yield stresses and 1/2 yield stress for SSE and 1/2 SSE respectively, in any structure a component damping values lower than those specified in Table 1 ....should be used .... to avoid underestimating the amplitude of vibration of dynamic stress." The guide requires that the appropiate damping values be used which reflect the state of stress that will be experienced by the equipment. In applying these values to the response of equipment, to an OBE and to an SSE, the selected damping should result in a dynamic response for the SSE that is greater than the response due to the OBE, all other factors being equal. The purpose of the statement in the guide is to note that at higher stress levels, the higher damping values could be used, but at lower stress levels, the lower values of damping should be used. Current procedures that are used in implementing R.G. 1.61 frequently result in an OBE response that is greater than the SSE response. This is because the higher damping under the SSE is used at all stress levels, low as well as high. This is obviously not the intent of the Regulatory Guide. A procedure has been developed which derives an expression relating the SSE response to the OBE response. Two factors are involved in the equation. The first involves the damping ratios for the SSE and OBE events and the second is the ratio between the levels of the OBE and SSE.

39246 **(BNL-NUREG—36636) Effect of pipe insulation losses on a loss-of-heat sink accident for an LMR.** Horak, W.C.; Guppy, J.G.; Wood, P.M. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Regulatory Research). 1985. Contract AC02-76CH00016. 11p. (CONF-850420—5). NTIS, PC A02/MF A01 - GPO. File Number TI85014216.

From 2. specialists' meeting on decay heat removal and natural convection in LMFBRs; Long Island, NY, USA (17 Apr 1985).

The efficacy of pipe radiation losses as a heat sink during LOHS in a loop-type LMR plant is investigated. The Super System Code (SSC), which was modified to include pipe radiation losses, was used to simulate such an LOHS in an LMR plant. In order to enhance these losses, the pipes were assumed to be insulated by rock wool, a material whose thermal conductivity increases with increasing temperature. A transient was simulated for a total of eight days, during which the coolant temperatures peaked well below saturation conditions and then declined steadily. The coolant flow rate in the loop remained positive throughout the transient.

39247 **(CEGB-TPRD/B—0441/N84) Comparison of alternative methods of calculating complementary cumulative distribution functions of health effects following an atmospheric radioactive release.** Ponting, A.C.; Nair, S. (Central Electricity Generating Board, Berkeley (UK). Berkeley Nuclear Labs.). Apr 1984. 26p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701875.

A concept extensively used in studying the consequences of accidental atmospheric radioactive releases is that of the Complementary Cumulative Distribution Function, CCDF. Various methods of calculating CCDFs have been developed with particular applications in putting degraded core accidents in perspective and in identifying release sequences leading to high risks. This note compares three methods with specific reference to their accuracy and computational efficiency. For two of the methods (that used in the US Reactor Safety Study code CRAC2 and extended version of that method), the effects of varying the sector width and considering site-specific population distributions have been determined. For the third method it is only necessary to consider the effects of site-specific population distributions.

39248 **(CONF-850713—1) Maintenance Personnel Performance Simulation (MAPPS) model: a human reliability analysis tool.** Knee, H.E. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 10p. NTIS, PC A02/MF A01 - GPO. File Number TI85014659.

From International conference on nuclear power plant aging, availability factor and reliability analysis; San Diego, CA, USA (3 Jul 1985).

The Maintenance Personnel Performance Simulation (MAPPS) model is a computerized, stochastic, task-oriented human behavioral model developed to provide estimates of nuclear power plant (NPP) maintenance team performance measures. It is capable of addressing person-machine, person-environment, and person-person relationships, and accounts for interdependencies that exist between the subelements that make up the maintenance task of interest. The primary measures of performance estimated by MAPPS are: (1) the probability of successfully completing the task of interest; and (2) the task duration time. MAPPS also estimates a host of other performance indices, including the probability of an undetected error, identification of the most- and least-likely error-prone subelements, and maintenance team stress profiles during task execution. The MAPPS model was subjected to a number of evaluation efforts that focused upon its practicality, acceptability, usefulness, and validity. Methods used for these efforts included a case method approach, consensus estimation, and comparison with observed task performance measures at a NPP. Favorable results, such as close agreement between task duration times for two tasks observed in the field (67.0 and 119.8 minutes, respectively), and estimates by MAPPS (72.0 and 124.0 minutes, respectively) enhance the confidence in the future use of MAPPS. 8 refs., 1 fig.

39240 **(CONF-850809—3) Numerical simulations of the nonlinear dynamic response of the CRBRP head assembly.** Kulak, R.F.; Fiala, C. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 3p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85003045.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

The head assembly of a liquid metal fast breeder reactor's (LMFBRs) vessel provides the topside barrier for radioactive core materials and coolant. Events that challenge the structural integrity of this barrier must be taken into account in the safety analysis of LMFBRs because a breach of the topside closure would permit a substantial inventory of sodium to enter into the secondary containment. One such accident, which is very unlikely but potentially severe, is a hypothetical core disruptive accident (HCDA), which has the mechanical consequence of propelling a slug of high velocity sodium against the head assembly. The numerical simulation of the dynamic response of the Clinch River Breeder Reactor Plant's (CRBRP) head closure during a 661 MJ HCDA and a qualitative comparison of deformation modes with a static loading test, which was performed by SRI International, are described.

39250 **(CONF-850809—40) Parameter studies to determine sensitivity of slug impact loads to properties of core surrounding structures.** Gvildys, J. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85009709.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

A sensitivity study of the HCDA slug impact response of fast reactor primary containment to properties of core surrounding structures was performed. Parameters such as the strength of the radial shield material, mass, void, and compressibility properties of the gas plenum material, mass of core material, and mass and compressibility properties of the coolant were used as variables to determine the magnitude of the slug impact loads. The response of the reactor primary containment and the partition of energy were also given. A study was also performed using water as coolant to study the difference in slug impact loads.

39251 **(CONF-850809—42) Thermal stress analysis of metal basemat concept.** Kennedy, J.M.; Schoeberle, D.F. (Argonne National Lab., IL (USA); Illinois Univ., Chicago (USA). Dept. of Mechanical Engineering). 1985. Contract W-31-109-ENG-38. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85009717.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

An analysis has been made of a proposed General Electric Company metal basemat concept employing the finite element program STRAW. The basemat is a cost low-carbon steel circular plate which is integral with a poured cavity wall. The integral basemat and cavity wall provides a barrier for core debris accommodation. A thermo-mechanical stress analysis of the unit was performed for several different thermal loadings. Integrity of the cavity wall is maintained if a cooling system is employed for the outer surface; if not, creep buckling failure is predicted. 6 refs., 3 figs., 2 tabs.

39252 **(CONF-850809—53) Viscoelastic creep of high-temperature concrete.** Pfeiffer, P.A.; Marchertas, A.H.; Bazant, Z.P. (Argonne National Lab., IL (USA); Northwestern Univ., Evanston, IL (USA). Technological Inst.). 1985. Contract W-31-109-ENG-38. 13p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85010511.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

Presented in this report is the analytical model for analysis of high temperature creep response of concrete. The creep law used is linear (viscoelastic), the temperature and moisture effects on the creep rate and also aging are included. Both constant and transient temperature as well as constant and transient moisture conditions are considered. Examples are presented to correlate experimental data with parameters of the analytical model by the use of a finite element scheme.

39253 **(CONF-850809—54) Some safety considerations in the selection of redans for pool-type LMR plants.** Pan, Y.C.; Pedersen, D.R.; Wang, C.Y. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85010523.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

Three basic safety issues in the selection of the redan design for a pool type liquid metal fast breeder reactor plant are examined. The first area examined is the effect of the redan selection on the integrity of the primary system pressure boundary in normal and offset conditions. The second area is on the consequence of the hypothetical core disruptive accident. The third area is on the consequence of the loss of heat sink accident. Some general discussion and numerical results are presented which may help in the selection of an optimum redan design. 3 refs., 7 figs.

39254 **(CONF-850810—7) Analysis of stratified flow mixing.** Soo, S.L.; Lyczkowski, R.W. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 25p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85006840.

From National heat transfer conference; Denver, CO, USA (4 Aug 1985).

The Creare 1/5-scale Phase II experiments which model fluid and thermal mixing of relatively cold high pressure injection (HPI) water into a cold leg of a full-scale pressurized water reactor (PWR) having loop flow are analyzed and found that they cannot achieve complete similarity with respect to characteristic Reynolds and Froude numbers and developing hydrodynamic entry length. Several analyses show that these experiments fall into two distinct regimes of mixing: momentum controlled and gravity controlled (stratification). 18 refs., 9 figs.

39255 **(CONF-850810—10) Corium quench in deep pool mixing experiments.** Spencer, B.W.; McUmber, L.; Gregorash, D.; Aeschlimann, R.; Sienicki, J.J. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 34p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85007897.

From National heat transfer conference; Denver, CO, USA (4 Aug 1985).

The results of two recent corium-water thermal interaction (CWTI) tests are described in which a stream of molten corium was poured into a deep pool of water in order to determine the mixing behavior, the corium-to-water heat transfer rates, and the characteristic sizes of the quenched debris. The corium composition was 60% UO_2, 16% ZrO_2, and 24% stainless steel by weight; its initial temperature was 3080 K, ~160 K above the oxide phase liquidus temperature. The corium pour stream was a single-phase 2.2 cm dia liquid column which entered the water pool in film boiling

at ~4 m/s. The water subcooling was 6 and 75C in the two tests. Test results showed that with low subcooling, rapid steam generation caused the pool to boil up into a high void fraction regime. In contrast, with large subcooling no net steam generation occurred, and the pool remained relatively quiescent. Breakup of the jet appeared to occur by surface stripping. In neither test was the breakup complete during transit through the 32 cm deep water pool, and molten corium channeled to the base where it formed a melt layer. The characteristic heat transfer rates measured 3.5 MJ/s and 2.7 MJ/s during the fall stage for small and large subcooling, respectively; during the initial stage of bed quench, the surface heat fluxes measured 2.4 MW/m^2 and 3.7 MW/m^2, respectively. A small mass of particles was formed in each test, measuring typically 0.1 to 1 mm and 1 to 5 mm dia for the large and small subcooling conditions, respectively. 9 refs., 13 figs., 1 tab.

39256 **(EGG—2403) Perspectives on source terms based on early research and development.** Pressesky, A.J. (EG and G Idaho, Inc., Idaho Falls (USA)). Jul 1985. Contract AC07-76ID01570. 23p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015534.

This report presents an overview of the key documentation of the research and development programs relevant to the source term issue which were undertaken by the Atomic Energy Commission between 1950 and 1970. The source term is taken to be the amount, composition (physical and chemical), and timing of the projected release of radioactivity to the environment in the hypothetical event of a severe reactor accident in a light water reactor of the type currently being licensed, built and operated. The objective is to illuminate and provide perspectives on (a) the maturity of the technical data base and the analytical methodology, (b) the extent to which remaining conservatisms can be applied to compensate for uncertainties, (c) the purpose for which the technology and methodology will be used, and (d) the need to keep problems and uncertainties in proper perspective. Comments that can provide some context for the difficult programmatic choices to be made are included, and technical considerations that may be inadequately applied or neglected in some current source term calculations were studied. This review has not uncovered any significant technical considerations that have been omitted or are being inadequately treated in current source term analyses, except perhaps the contribution made to in-containment aerosols by coolant comminution upon escape at pressure from the reactor coolant system. 11 refs.

39257 **(EGG-EA—6861) Demonstration of containment purge and vent valve operability for the Hope Creek Generating Station, Unit 1 (Docket No. 50-354).** Kido, C. (EG and G Idaho, Inc., Idaho Falls (USA)). May 1985. Contract AC07-76ID01570. 13p. NTIS, PC A02/MF A01 - GPO. File Number TI85014636.

The containment purge and vent valve qualification program for the Hope Creek Generating Station has been reviewed by the NRC Licensing Support Section. The review indicates that the licensee has demonstrated the dependability of containment isolation against the buildup of containment pressure due to a LOCA/DBA with the restrictions that during operating conditions 1, 2, and 3 all purge and vent valves will be sealed closed and under administrative control, and during power ascension and descension conditions the 26 in. inboard valve (1-GS-HV-4952) will be used in series with the 2 in. bypass valve (1-GS-HV-4951) to control the release of containment pressure.

39258 **(EGG/LTR—10-25) LOFT engineered safety feature seismic analysis review.** Smith, N.B. (EG and G Idaho, Inc., Idaho Falls (USA)). 18 Oct 1977. Contract AC07-76ID01570. 19p. (RE-E—77-164). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015427.

To show that LOFT can be safely shut down and maintained shut down during a seismic event requires that the Engineered Safety Features (ESF) be operational during and following an earthquake. This report compiles LOFT seismic reports and identifies those systems containing ESF's as a first step in identifying the status of ESF seismic analysis. The following action is required. (1) PPS systems should be reviewed and all equipment (piping, active components, structures) requiring seismic qualification tabulated. (2) The present data should be reviewed and that PPS equipment that is qualified should be documented. (3) Methods of qualifying the remaining PPS equipment should be established. (4) All PPS equipment should be qualified prior to nuclear operation. Work on the above is in progress under Task 521916.

39259 **(EGG/LTR—10-34) LOFT technical specifications regarding relief valves testing.** Larson, R.H. (EG and G Idaho, Inc., Idaho Falls (USA)). 20 Dec 1977. Contract AC07-76ID01570. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015426.

The Technical Specification requirement for testing relief valves per common nuclear industry practice, is to measure set pressure only. The testing is done on the plant, on a test stand, or by a testing laboratory. Leak testing as performed by the industry is done usually at the same time as the set pressure test. Two examples given were measuring bubbles per minute (Nitrogen) from a tygon tube immersed in a bucket of water and a soap bubble test. However leak testing was not a Technical Specification requirement or an Inservice Inspection requirement. Reseat pressure testing was not practiced by any of the plants contacted.

39260 **(EGG/LTR—111-90) Analysis of the Control Rod Cluster Assembly for combined subcooled blowdown and scram loading.** Miller, G.K. (EG and G Idaho, Inc., Idaho Falls (USA)). 6 Jun 1978. Contract AC07-76ID01570. 24p. (RE-A—78-029). NTIS, PC A02. File Number DE85015466.

An analysis of the Control Rod Cluster Assembly was performed by MPR Associates in March 1976. The analysis did not consider the possibility of having the differential pressure due to subcooled blowdown act on the control rods once the assembly becomes unlatched during a scram. The analysis performed by MPR Associates was extended to include this possibility. The results indicate that the entire control rod assembly structure is adequate for this new loading possibility. Additionally, the anti-ejection pawl assembly of the Control Rod Drive Mechanism (CRDM) should function if the differential pressure force were to act upward. The analysis is presented in Appendix A. In Appendix A, however, the conclusion is made that the hub of the control rod spider assembly could potentially be overstressed. This issue is resolved in Appendix B, where the hub of the spider assembly is shown to be adequate, using the finite element method. Microfiche containing the SAP IV program output for the analysis of the spider hub is included in Appendix C.

39261 **(EGG/LTR—111-100) Steady state power range flow map analysis.** Elger, D.F. (EG and G Idaho, Inc., Idaho Falls (USA)). 2 Aug 1978. Contract AC07-76ID01570. 26p. (RE-A—78-110). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015439.

The objective of this report is to assess the steady state heat removal capability of the LOFT core for power range testing. This is achieved by calculating the required reactor coolant flow, for which the thermal design basis is met, as a function of power. The steady state thermal design basis is (1) the Minimum Departure from Nucleate Boiling Ratio, MDNBR, is greater than or equal to 1.13 and (2) no fuel melting at the center of any fuel rods. The results of this report are: (1) a map of minimum required reactor loop flow as a function of power. This is shown in Figure 5 and is defined by DNBR limitations. At any power below 36.1 MW a minimum worst case loop flow of 1.85×10^6 lbm/h is required. This flow corresponds to the lower limit of mass flux for the LOFT-I DNB correlation. At 50 MW the minimum worst case loop flow is 2.72×10^6 lbm/h. (2) The maximum worst case reactor power is 59 MW. This is based on fuel centerline melting limits and is independent of flow. 8 refs., 5 figs.

39262 **(EGG/LTR—111-102) Baseline data for LOFT Level I core requalification.** Cannon, J.W.; Briscoe, A.V.; Carpenter, W.R.; Chick, D.R.; Knight, D.W.; Serrano, W.; Talbert, R.J.; Yarbrough, W.M.; Zentner, M.D.; Zimmerman, W.L. (EG and G Idaho, Inc., Idaho Falls (USA)). 12 Dec 1978. Contract AC07-76ID01570. 449p. (RE-P—78-075). NTIS, PC A19. File Number DE85015429.

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Fuel Module Requalification (FMR) is performed prior to achieving significant power levels after each Loss of Coolant Experiment (LOCE). Level I Requalification consists of a progressive series of tests designed to determine whether sufficient core damage has occurred to make Levels II or III Requalification testing necessary. It includes an examination of LOCE data to determine whether core damage is probable and a series of functional and physics tests to examine operational characteristics of the reactor system. This series of tests is basically a comparison of data obtained before (baseline) and after the LOCE for differences which may indicate core damage has occurred. This report is written to support the Level I Requalification. It presents the pre-LOCE baseline data and contains a discussion of this data and of pertinent items to consider when performing the tests to make Level I Requalification as reliable as possible. The data, which were acquired during Zero Power Physics testing (completed March 13, 1978), are presented in the form of plots and tables for efficient data analysis during future requalification testing. Additional detailed, raw test data are presented in the Appendices so that, when necessary, detailed test conditions and results may be compared. The nuclear signature test results, which are not readily reduceible and require specialized expertise for analysis, are contained entirely in Appendix E. 6 refs., 46 figs., 14 tabs.

39263 **(EGG/LTR—112-88-Suppl.1) Dynamic response of blowdown suppression tank shielding structure. Supplement 1.** Smith, N.B. (EG and G Idaho, Inc., Idaho Falls (USA)). 3 Mar 1978. Contract AC07-76ID01570. 83p. NTIS, PC A05. File Number DE85015459.

A detailed analysis has been performed to determine the maximum displacement at the top of the LOFT suppression tank shielding structure due to SSE bedrock loading. A maximum displacement of .05 inch occurs at the top of the structure. The results of this analysis demonstrate that the differential movement between the blowdown piping located on the MTA and the BST shielding wall is negligible. A finite element code, SAP IV, was used to calculate the displacements of the shielding structure due to a response spectra representation of the seismic loading. A copy of that output is provided as an Attachment.

39264 **(EGG/LTR—112-121) Seismic stress analysis for the LOFT Blowdown ion exchanger relocation support platform.** Miller, G.K. (EG and G Idaho, Inc., Idaho Falls (USA)). 24 Mar 1978. Contract AC07-76ID01570. 29p. (RE-A—78-002). NTIS, PC A03. File Number DE85015450.

This report describes a deadweight and seismic stress analysis performed on the LOFT Ion Exchanger Support Platform. The analysis was performed on the platform with the Blowdown System Ion Exchanger attached. Resulting stress levels were checked against limits specified in ASME Section III, Division 1, Subsection NF for Class 2 supports. 7 refs., 2 figs.

39265 **(EGG/LTR—112-132) Blowdown system vents and drains stress analysis.** Barry, W.J. Jr. (EG and G Idaho, Inc., Idaho Falls (USA)). 14 Feb 1978. Contract AC07-76ID01570. 46p. (RE-A—77-145). NTIS, PC A03. File Number DE85015453.

This report presents the results and recommendations of an ASME Section III, Class 2 analysis of the LOFT Vents and Drains piping. Load conditions considered were normal operating conditions, Operating Basis Earthquake (OBE), Safe Shutdown Earthquake (SSE), Loss-of-Coolant-Experiment (LOCE), and Loss-of-Coolant-Accident (LOCA). The existing design was found to be structurally adequate with modifications (two thermal expansion loops and support changes) as presented in the recommendations. This analysis is an update of R.G. Rahl's LTR 112-83 and B.F. Saffell, Jr.'s LTR 114-59 necessitated by design changes to the system. It should be noted that due to the small size of the pipes involved, a Class 2 analysis was performed even though the system is Class 1.

39266 **(EGG/LTR—112-133) LOFT Blowdown Reflood Assist Bypass Piping Weld elastic stress analysis.** Chun, R.C. (EG and G Idaho, Inc., Idaho Falls (USA)). 14 Feb 1978. Contract AC07-76ID01570. 16p. (RE-A—77-148). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015452.

The most severely stressed region of the LOFT Blowdown Reflood Assist Bypass Piping Weld is the inside surface. This region will have a longitudinal tensile stress of 85 ksi and a tangential tensile stress of 94 ksi. The less severely stressed outside surface will have a longitudinal compressive stress of 12 ksi and a tangential compressive stress of 20 ksi. These stresses will serve as the basis for a fracture-mechanics analysis. The fracture-mechanics analysis results are documented in LTR 112-119, "Fracture Mechanics Evaluation of Some LOFT Blowdown System Primary Coolant Cold Leg Welds". 3 refs., 7 figs.

39267 **(EGG/LTR—113-53) LOFT lower ECC line missile shield and restraint.** Rahl, R.G. (EG and G Idaho, Inc., Idaho Falls (USA)). 31 Aug 1978. Contract AC07-76ID01570. 26p. (RE-A—78-169). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015442.

The purpose of this investigation is to determine the adequacy of the LOFT lower ECC line missile shield and pipe restraint. To perform their intended functions, they must assure that a missile will not fail the ECC line downstream of the check valve and, thus, vent the reactor vessel. The analysis of the missile shield for the lower ECC line check valve has been completed. The shield has been shown to be capable of absorbing the specified design missile energy of 50,300 ft-lb without excessive deflection and consequent valve damage. It has also been shown that the prescribed missile will not penetrate the shield. An adjacent pipe restraint has also been analyzed and determined that it will perform its prescribed task of assuring that a failure of the ECC pipe caused by a missile will occur upstream of the check valve. A recommendation is made, however, to add 3/4-inch nuts to the 8-inch long bolts in the restraint design. The shield fabrication, installation, and LTR recommendation were implemented under WBS 521527. The shield is to be installed prior to power range testing per SWR 51648. 5 refs.

39268 **(EGG/LTR—114-97) LOFT CIS analysis 1/2"-PCS-1-VA outside penetration S-5D.** Condie, C.G. (EG and G Idaho, Inc., Idaho Falls (USA)). 13 Jul 1978. Contract AC07-76ID01570. 56p. (RE-A—78-066). NTIS, PC A04. File Number DE85015443.

Line 1/2"-PCS-1-VA outside the LOFT containment penetration S-5D was analyzed to ASME Code, Subsection NC (Class 2) criteria. This piping is part of the Containment Isolation System. The model considered the piping from the penetration through one isolation valve and to the first wall through which the line passes. Results of this analysis show that this section of the line will meet Class 2 requirements without modification.

39269 **(EGG/LTR—115-13-Suppl.A) LOFT feed and steam lines isolation snubbers support structure. Supplement A.** Rahl, R.G. (EG and G Idaho, Inc., Idaho Falls (USA)). 22 Sep 1977. Contract AC07-76ID01570. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015425.

The support structure for the LOFT feed and steam lines isolation snubbers has been reanalyzed. The original analysis used loads from piping analyses of the feed line and steam line. These loads have changed due to redesign and reanalysis of these lines. This report revision compares old and new loads and applies the new where necessary. Comparison showed that the loads applied in the original analysis were greater than present LOCE loads and present LOCA + SSE loads are greater than the loads applied in the original report. Analysis was in accordance with the 1970 Edition of the AISC Manual of Steel Construction and all stresses were found to be within the allowable range. 5 refs.

39270 **(EGG/LTR—115-31-App.H) Secondary coolant main feedwater pump. Appendix H.** Stevenson, D.H. (EG and G Idaho, Inc., Idaho Falls (USA)). 9 May 1978. Contract AC07-76ID01570. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015444.

This LTR consists of the recommended characteristics for the main feedwater pump (an Ingersoll-Rand 4HMTA-6 or equivalent).

39271 **(EGG/LTR—115-33) Auxiliary feedwater requirements.** Stevenson, D.H. (EG and G Idaho, Inc., Idaho Falls (USA)). 9 May 1978. Contract AC07-76ID01570. 8p. NTIS, PC A02. File Number DE85015448.

This LTR includes calculations which determine the following: (1) adequacy of the 8-gpm makeup pump to remove decay heat and preclude boiling steam generator dry; (2) time for primary plant cooldown to 350°F using 8-gpm makeup pump; (3) water consumed (including filling of the steam generator) removing decay heat and cooling plant down; and (4) power requirements for removing decay heat, cooldown of plant to 350°F and filling of steam generator. This document was originally Appendix E of SDD 1.1.5B.

39272 **(EGG/LTR—115-39) Stress analysis of LOFT condensate receiver seismic restraint.** Beers, R.J. Jr. (EG and G Idaho, Inc., Idaho Falls (USA)). 3 Mar 1978. Contract AC07-76ID01570. 36p. (RE-A—78-019). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015447.

A stress analysis has been completed for the LOFT condensate receiver seismic restraint in accordance with the AISC Manual of Steel Construction, the ACI Building Code for Reinforced Concrete, and RDT loading guidelines. Initially, no information could be found pertaining to the reinforcing in the concrete support, thus a steel brace design was recommended and is analyzed herein. After the brace was analyzed, reinforcing details were discovered. Consequently, there are two parts to the report. The first part includes analysis of the recommended steel brace design for the seismic restraint assuming the concrete resists none of the load. The second portion indicates that the existing concrete support is adequate to resist seismic (operating basis earthquake) loads. 4 refs.

39273 **(EGG/LTR—121-4) Structural analysis of 3″-PR-94-E from nozzle S-1A to the pressure reduction and decontamination solution sump.** Murdock, S.M. (EG and G Idaho, Inc., Idaho Falls (USA)). 3 Mar 1978. Contract AC07-76ID01570. 15p. (RE-A—78-008). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015460.

Line 3″-PR-94-E was analyzed to find the nozzle loads at nozzle S-1A created by this line. The analysis was performed to the criteria of the ASME Boiler and Pressure Vessel Code, Section III, Class 2. Loading conditions considered were: (1) weight, (2) pressure, (3) thermal expansion, and (4) safe shutdown earthquake (SSE). The piping satisfies Code criteria for these conditions. 6 refs., 1 fig.

39274 **(EGG/LTR—123-7) LOFT CIS analysis penetration S-13D 24″ H and V duct.** Condie, C.G. (EG and G Idaho, Inc., Idaho Falls (USA)). 13 Jul 1978. Contract AC07-76ID01570. 51p. (RE-A—78-054). NTIS, PC A04. File Number DE85015446.

The 24″ H & V Duct and related piping outside the LOFT containment and connected to containment penetration S-13D was analyzed to ASME Code, Subsection NC (Class 2) criteria. This duct is part of the Containment Isolation System. The model considered the duct from the containment OD outward through the second isolation valve. Results of this analysis show that this section of line will meet Class 2 requirements without modification. 4 refs., 2 figs., 3 tabs.

39275 **(EGG/LTR—129-11-Suppl.1) LOFT shield tank steady state temperatures with addition of gamma and neutron shielding. Supplement 1.** Kyllingstad, G. (EG and G Idaho, Inc., Idaho Falls (USA)). 3 Feb 1978. Contract AC07-76ID01570. 4p. (RE-A—77-098-Suppl.1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015434.

Some changes have been made in the final design of the LOFT gamma and neutron shield canister assembly. These changes involve the addition of spacer plates every 2 inches in each canister to minimize powder separation, the deletion of the high density shield material (95% theoretical density) from each canister and the lengthening of each canister to 8.41 inches. These changes, however, have a negligible effect on the thermal analysis of the shielding system. The added spacer plates provide a negligibly small conduction path. The deletion of the 95% theoretical density material only improves the insulating qualities of the neutron shield, since the 60% theoretical density material in its place is a better insulator. Finally, the addition of approximately 2 inches of neutron shield does not influence previous calculations since the total effective length was conservatively estimated at 20.5 inches.

39276 **(EGG/LTR—132-1) LOFT CIS analysis 8″-IW-177-AB inside penetration S-2A.** Condie, C.G. (EG and G Idaho, Inc., Idaho Falls (USA)). 19 Sep 1978. Contract AC07-76ID01570. 86p. (RE-A—78-080). NTIS, PC A05. File Number DE85015431.

Line 8″-IW-177-AB and related piping inside the LOFT containment which is connected to containment penetration S-2A was analyzed to ASME Code, Subsection NC (Class 2) criteria. This line is part of the Containment Isolation System. The model considered the 8″ line inward from the penetration through a check valve then through the first isolation valves in one 4″ OD and two 3″ OD branch lines. This analysis showed that there were two overstressed regions in the originally designed system during the Safety Shutdown Earthquake. It is recommended that three restraints, described in this report, be added to the system so that it will meet Class 2 requirements.

39277 **(EGG/LTR—141-62-Suppl.1) LOFT DTT rake assembly design fluid loads. Supplement 1.** Whitehead, T.J. (EG and G Idaho, Inc., Idaho Falls (USA)). 16 Aug 1978. Contract AC07-76ID01570. 11p. (RE-E—77-172-Suppl.1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015435.

This supplement contains additional thermal analyses of the LOFT DTT rake assembly. Previous work, Reference 1, calculated fluid induced loads on the original DTT rake assembly using the maximum expected momentum flux (188,000 lbm/ft-sec^2). The additional analyses results contained in this supplement were required to account for modification of the DTT rake assembly in which the frontal area of the assembly was increased by 10.7% (Reference 2). In addition to the rake assembly modification, the maximum expected momentum flux was reduced to 86,700 lbm/ft-sec^2 for the planned L2 series 5-inch LOCE's (Reference 3). 4 refs.

39278 **(EGG/LTR—1115-43) Faulted stress analysis of the LOFT Lower Core Support Plate.** Finicle, D.P. (EG and G Idaho, Inc., Idaho Falls (USA)). 7 Jul 1978. Contract AC07-76ID01570. 27p. (RE-A—78-107). NTIS, PC A03. File Number DE85015440.

The LOFT Reactor Lower Core Support Plate has been analyzed using LOCA plus SSE loading. The LOCA loading was obtained from LTR 1115-39, Ref. 1, which used LOCA pressures from Ref. 5. SSE loading on the Lower Core Support Plate was obtained from LTR 1115-31, Ref. 2. The combination of LOCA plus SSE is considered a faulted loading condition. The analysis showed the lower Core Support Plate to be structurally adequate and that it meets all of the ASME Section III requirements for faulted conditions. A listing of the computer code used in this analysis is contained in Appendix B. 10 figs.

39279 **(EGG/LTR—1118-9) CRDM reliability study.** Close, J.A.; Cooper, C.H.; Hunt, G.L.; Atkinson, S.A. (EG and G Idaho, Inc., Idaho Falls (USA)). 1 Mar 1978. Contract AC07-76ID01570. 13p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015455.

During the checkout of the Control Rod Assembly (CRA) control system, a fault occurred which could potentially drive all four CRA's at speeds >2″/min. Subsequent experimental tests were performed to purposely identify attainable rod speeds as a function of supplied voltage. Results indicated a rod speed of up to 29.7″/min was attainable at 100 volts. The LOFT Technical Specifications (Section 3.10.3.1) limit the voltage at the stators of the CRDMs to a maximum of 90 volts which will preclude rod speeds >28″/min with a 95% reliability at a 95% confidence level. In addition, redundant overvoltage monitors (OVMs) were installed in the CRA control system to preclude an overvoltage situation. The purpose of this LTR is to illustrate the probability of achieving an excessive rod speed event (>28″/min) both with and without the OVMs.

39280 **(EGG/LTR—1141-30) Flow-induced vibration study in the LOFT steam generator.** Carmichael, C.F. (EG and G Idaho, Inc., Idaho Falls (USA)). 18 Oct 1977. Contract AC07-76ID01570. 142p. (RE-A—77-045). NTIS, PC A07. File Number DE85015471.

The consequences of flow induced vibration in the LOFT steam generator were studied. Tube-baffle contact and fretting wear are expected to occur while tube-tube contact is not predicted. The LOFT steam generator is, in all probability adequate from a fluid induced viewpoint for the scheduled service of the LOFT facility at power. 37 refs., 5 figs., 3 tabs.

39281 **(EGG/LTR—1141-33) Steam generator specification design transients.** Stevenson, D.H. (EG and G Idaho, Inc., Idaho Falls (USA)). 12 May 1978. Contract AC07-76ID01570. 165p. NTIS MF A01; 2; GPO Dep. File Number DE85015472.

This LTR documents LOFT Plant operational, upset, and emergency transients, and pressure and temperature conditions as generated by the LOFT Plant Dynamic analysis model of the primary system for use in steam generator specification. The results of this LTR have been supplemented by succeeding efforts as follows: FSAR analysis - (a) loss of load during full power operation, (b) loss of primary pump electrical power, and (c) loss of site power; and LOFT maneuvering analysis - (a) +-10% step change in steam flow, and (b) manual reactor trip. The initial plant conditions considered may differ from this LTR plant conditions. Items are outlined to document in this LTR other analyses which cover the same plant transients. 53 figs., 1 tab.

39282 **(EGG/LTR—1144-26) LOFT pressurizer pressure relief piping system stress analysis and fatigue life report.** Muffett, J.W. (EG and G Idaho, Inc., Idaho Falls (USA)). 19 Jan 1978. Contract AC07-76ID01570. 235p. (RE-A—78-013). NTIS, PC A11. File Number DE85015454.

A stress analysis was performed on the LOFT Pressurizer Pressure Relief System to determine if it met the requirements of the ASME Boiler and Pressure Vessel Code, Section III, 1974 Edition, for Class 1 and Class 2 components. Deadweight, thermal expansion, seismic, design LOCE, and LOCA loads were considered. The results of this analysis indicate that the LOFT pressurizer pressure relief system will comply with Code specifications provided modifications are made to the hanger support configuration and one small section of pipe. The recommended changes are listed below. Note that some of these hangers were previously required based upon an analysis which subjected this same piping system to a reduced LOCE (20 millisecond valve opening). (1) Addition of Snubbers as per letter HIK-12-75, LOFT Pipe Hanger Requirements on Main Feed Main Steam Pressurizer and ECC Systems. (2) The 1/2" Line 1/2"-PCS-10 between the tee and CVP-136-19 must be increased in diameter to 1.050 inches (OD of nominal 3/4" pipe). (3) Modification of Unibals and flat bars as per letter Muff-2-76, required change of flat bar hangers and unibals on pressure relief and pressurizing piping. 9 refs., 6 figs., 1 tab.

39283 **(EGG/LTR—1217-4) Analysis of LOFT containment nozzles 11A, 11B, 11D, 12A, 13B, 13C, and 13D by Bijlaard method.** McFadden, D.F. (EG and G Idaho, Inc., Idaho Falls (USA)). 24 Jul 1978. Contract AC07-76ID01570. 54p. (RE-A—78-131). NTIS, PC A04. File Number DE85015457.

The purpose of this analysis was the calculation of stresses in the LOFT Containment Vessel at the point of nozzle penetration produced by loads on the nozzles and to show that those stresses are within the 1965 ASME Boiler and Pressure Vessel Code allowables. The stress determination was done by the method developed by P. P. Bijlaard on the worst load case for each diameter nozzle. The operating basis earthquake (OBE) at nozzle 11D produced the most severe load case. All load cases resulted in containment vessel stresses that were less than the allowables as stated in N-414 of the 1965 ASME Boiler and Pressure Vessel Code.

39284 **(EGG/LTR—1310-20) Reactor coolant pumps generator and flywheel seismic analysis.** Singh, J.N.; Kuehster, C.J. (EG and G Idaho, Inc., Idaho Falls (USA)). 12 May 1978. Contract AC07-76ID01570. 20p. (RE-A—77-131). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015476.

The LOFT Primary System Motor Generator Set was analyzed for sliding and overturning during a seismic event. The assembly is located in TAN 650, Room B239, and is satisfactory against seismic loading.

39285 **(EGG-M—01281) Loss of offsite power in pressurized water reactors: a combined probabilistic and thermal-hydraulic analysis.** Fletcher, C.D.; Bruske, S.J. (EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 10p. (CONF-810905—33). NTIS, PC A02/MF A01 - GPO. File Number TI85013803.

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

The Pressurized Water Reactor (PWR) loss of offsite power initiating event was studied at the Idaho National Engineering Laboratory as a part of the US Nuclear Regulatory Commission's (NRC) Severe Accident Sequence Analysis Program. An event tree was developed and used as a basis for investigating high risk accident sequences initiated by a loss of offsite power. Specific high risk sequences for further study were determined by assigning probabilities to events within the tree. The thermal-hydraulic responses of three PWRs of different vendors were calculated for these high risk sequences using the RELAP4/MOD7 computer code. Actions to mitigate the consequences of certain sequences were identified and the critical times for their implementation were determined. 2 refs., 6 figs., 2 tabs.

39286 **(EGG-M—04485) Reactor coolant pump shaft seal behavior during blackout conditions.** Mings, W.J. (EG and G Idaho, Inc., Idaho Falls (USA)). 1985. Contract AC07-76ID01570. 12p. (CONF-850670—21). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014574.

From ASME pressure vessel and piping division conference; New Orleans, LA, USA (24 Jun 1985).

The United States Nuclear Regulatory Commission has classified the problem of reactor coolant pump seal failures as an unresolved safety issue. This decision was made in large part due to experimental results obtained from a research program developed to study shaft seal performance during station blackout and reported in this paper. Testing and analysis indicated a potential for pump seal failure under postulated blackout conditions leading to a loss of primary coolant with a concomitant danger of core uncovery. The work to date has not answered all the concerns regarding shaft seal failure but it has helped scope the problem and focus future research needed to completely resolve this issue.

39287 **(EGG-M—05481) Use of process computer graphics during LOFT loss-of-coolant experiments.** Bray, M.A. (EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 8p. (CONF-810667—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012427.

From Enlarged halden programme group meeting on process computer applications; Fredrikstad, Norway (14 Jun 1981).

This paper describes computer graphics used during reactor transient testing at the Loss-of-Fluid Test (LOFT) Facility. All of the work described in this paper is being conducted at the Idaho National Engineering Laboratory (INEL) for the US Nuclear Regulatory Commission (NRC). A brief description of the LOFT program and INEL display graphics research programs are given. Next, real-time applications of computer graphics that have been used during LOFT testing are demonstrated. Finally, posttest LOFT computer graphics applications will be shown. 7 figs.

39288 **(EGG-M—08385) Hand calculational techniques in reactor safety analysis.** Driskell, W.E.; Larson, J.R. (EG and G Idaho, Inc., Idaho Falls (USA)). 1985. Contract AC07-76ID01570. 27p. (CONF-851007—9). NTIS, PC A03/MF A01; GPO Dep. File Number DE85014576.

From 3. international meeting on reactor thermal hydraulics; Newport, RI, USA (15 Oct 1985).

A study is being conducted by EG and G Idaho, Inc. to determine if simple calculational aids can be developed that will assist the Reactor Safety Team (RST) in gathering and assessing information for nuclear accident response. The RST must be able to quickly predict trends in core and containment conditions that could lead to fuel damage, release of radioactive materials to the environment, and the elapsed time before their occurrence. The aids presently envisioned consist of hand calculational and precalculated techniques, possibly presented by graphs or nomograms. Example aids have been developed for specific plants and three specific accident scenarios. The scenarios selected are: (1) station blackout (total loss of

AC power), (2) stuck-open power operated relief valve (SOPORV), and (3) a main steam line break (MSLB). The specific scenarios are selected to represent core damage results. This paper presents a brief description of the procedure followed in the development process. Details of the development of one aid, the station blackout, are provided in Section 3 along with comparisons of the results to data calculated by large thermal-hydraulic computer programs. Section 4 summarizes the description and assumptions included for the SOPORV and MSLB. Limited comparisons are included for the SOPORV scenario. Finally, conclusions are given in Section 5, which also provides a brief look at future related work.

39289 **(EGG-M—10385) Effectiveness of recovery techniques during steam generator tube rupture in the Semiscale Mod-2B facility.** Loomis, G.G. (EG and G Idaho, Inc., Idaho Falls (USA)). 1985. Contract AC07-76ID01570. 12p. (CONF-850646—9). NTIS, PC A02/MF A01 - GPO. File Number TI85014571.

From 2. international specialists meeting on small break LOCA analysis in LWRs; Pisa, Italy (24 Jun 1985).

Results are presented from an experimental investigation of recovery techniques commonly used during steam generator tube rupture transients. Recovery experiments were conducted in the Semiscale Mod-2B facility at typical pressurized water reactor (PWR) conditions (6 to 8 MPa, saturated). Recovery techniques found effective for loop pressure control and/or subcooling during a tube rupture included: unaffected loop secondary feed and steam using auxiliary feedwater and controlled atmospheric dump valve steam flow; primary feed and bleed using pressurizer power-operated relief valve operation along with safety injection (SI); and initiation or termination of SI. Phenomena associated with the recovery procedures included condensation, steam compression, mass redistribution, and natural circulation. Results are related to actual PWR transient experience at the Ginna nuclear generating plant. 5 refs., 8 figs.

39290 **(EGG-M—13985) Experimental applications of an expert system to operator problem solving in process control.** Nelson, W.R.; Jenkins, J.P. (EG and G Idaho, Inc., Idaho Falls (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1985. Contract AC07-76ID01570. 13p. (CONF-850836—1). NTIS, PC A02/MF A01. File Number TI85014596.

From American Institute of Chemical Engineers national meeting; Seattle, WA, USA (25 Aug 1985).

The United States Nuclear Regulatory Commission (USNRC) has sponsored a program to assess the effectiveness of expert systems for nuclear reactor operators. The project has included two human factors experimental evaluations of the Response Tree expert system, a prototype expert system for helping nuclear reactor operators respond to emergency conditions. This paper discusses the Response Tree expert system, the experiments which have been performed to test its effectiveness, and the results of the experiments. Reference is made to the accident at TMI. 12 refs.

39291 **(EPRI-NP—3802-Vol.2) Thermal and fluid mixing in a 1/2-scale test facility. Volume 2. Data report. Final report.** Dolan, F.X.; Valenzuela, J.A. (Creare, Inc., Hanover, NH (USA)). Jul 1985. 218p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920740.

This report presents data from an experimental study of fluid mixing in a 1/2-scale model of the cold leg, downcomer, lower plenum, pump simulator, and loop seal typical of a Westinghouse Pressurized Water Reactor. The tests were transient cooldown tests in that they simulated an extreme condition of Small Break Loss of Coolant Accident (SBLOCA) during which cold High Pressure Injection (HPI) fluid is injected into stagnant, hot primary fluid with complete loss of natural circulation in the loop. Extensive temperature, velocity, and heat transfer coefficient data are presented at two cold leg Froude numbers: 0.052 and 0.076. The 1/2-scale data are compared with earlier data from a 1/5-scale, geometrically similar facility to assess scaling principles.

39292 **(EPRI-NP—3834-Vol.1) Systems interaction identification procedures. Volume 1. Assessment and summary.** Kripps, L.J.; Conradi, L.L. (Energy, Inc., Kent, WA (USA)). Jul 1985. 192p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920741.

The systems interaction (SI) issue encompasses safety, plant performance, and utility financial concerns. To address this important and complex issue, EPRI assembled a team of contractors with differing perspectives on the SI issue. These perspectives were derived from experience with deterministic design basis licensing and probabilistic risk assessment (PRA). The objectives of the contractor activities were to obtain an understanding of the SI issue, review and assess several SI analysis methods, develop a generalized approach for addressing SI concerns, and prepare guidelines for SI related plant walkdowns. Volume I of this report on the results of contractor activities presents an implicit definition that gives a reasonable scope to the SI issue; describes a general analysis approach that considers existing design and safety analyses; reviews and assesses several SI analysis methods; and provides guidelines for planning an effective plant walkdown. Volumes II, III, IV, and V document the four specific analytical methods for identifying SIs which were the basis for the Volume I results.

39293 **(EPRI-NP—3834-Vol.2) Systems interaction identification procedures. Volume 2. Tools and concepts to facilitate a systems interaction study.** Lim, J.J.; Rubin, A.V.; Unione, A.J. (Impell Corp., Walnut Creek, CA (USA)). Jul 1985. 115p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920742.

Using the guidelines and procedures developed in this study, utilities can select cost-effective analytic methods for identifying potential systems interactions at individual power plants. The report also outlines a procedure for on-site visual inspections and details four major analytic techniques.

39294 **(EPRI-NP—3834-Vol.5) Systems interaction identification procedures. Volume 5. Application of probabilistic risk assessment methods to the systems interaction issue.** Fleming, K.N.; Chapman, J.R. (Pickard, Lowe and Garrick, Inc., Newport Beach, CA (USA)). Jul 1985. 202p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920743.

The EPRI program in systems interactions addresses this important issue from several different perspectives including the perspective of probabilistic risk assessment (PRA). The PRA perspective is viewed as essential to the resolution of the systems interactions issue because the underlying technical issues are intimately related to the PRA concept of dependent events. This intimate relationship is described in this report and is used to set forth a PRA framework for identifying potential dependent events, based in part on plant walkdowns, and for evaluating their importance in terms of their contributions to risk to the plant owner and to the public. Even a limited application of PRA methods toward resolution of the systems interaction issue can be useful in identifying and evaluating dependent events. Completion of all tasks in a full scope PRA is not required to address this issue. The specific PRA tasks useful for systems interaction analysis are delineated and described in this report. 29 refs., 24 figs., 24 tabs.

39295 (EPRI-NP—3912-SR-Vol.2, pp 82.1-82.10) **Extended value-impact decision making methodology for nuclear power plant modifications.** Nelson, P.F.; Kastenberg, W.E. (Univ. of California, Los Angeles). Feb 1985. Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303 $125.00. File Number TI85920542. (CONF-850206—Vol.2).

From International ANS/ENS topical meeting on probabilistic safety methods and applications; San Francisco, CA, USA (24 Feb 1985).

Value-impact is the term used by the Nuclear Regulatory Commission (NRC) to define what is traditionally known as cost-benefit analysis; values measure the beneficial consequences of a proposed action, impacts measure the adverse consequences, i.e. costs of the proposed action. In the regulatory framework, value-impact or cost-benefit is but one input to decision making. The present study was performed in order to illustrate how decision

makers can utilize a more structured method for determining nuclear regulatory policy. In order to be useful, the method must treat all dominant factors that influence a decision; including economic, as well as societal factors such as environmental, health and safety. The method must also allow decisions to be consistent with the preferences of the decision maker as well as other interested groups. Major problems in decision making are how to incorporate non-quantifiable attributes in the method and how to reach consensus between opposing viewpoints. The Analytic Hierarchy Process (AHP) can attack these issues by making it possible to structure the decision in a way that subjective input can be included. In this paper, the AHP is developed and used to rank the value/impact ratios of alternative decay heat removal systems. It is believed that use of the AHP can decrease limitations present in a current value-impact analysis.

39296 (EPRI-NP—3912-SR-Vol.2, pp 89.1-89.6) **Human error data collection analysis program undertaken since 1982 by Electricite de France with INPO.** Ghertman, F.; Dietz, P. (Electricite de France). Feb 1985. Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303 $125.00. File Number TI85920542. (CONF-850206—Vol.2).

From International ANS/ENS topical meeting on probabilistic safety methods and applications; San Francisco, CA, USA (24 Feb 1985).

The preoccupation for reducing in frequency and importance events which harm at various degrees the availability, the safety and the security of nuclear power plants lead Electricite de France, in cooperation with INPO (Institute of Nuclear Power Operations) to launch a Human Error Collection and Analysis Program. On account with the difficulties met to develop such a program, it has been decided to begin with a pilot data collection limited to a six months period (October 1982 to April 1983) and three nuclear power plants (three US units and two French units). This pilot data collection followed four steps: (1) elaboration of the collection methodology; (2) sensitization and related training of the power plant personnel; (3) data collection in the power plant; and (4) analysis of the data and results. Each of the steps are discussed in the paper.

39297 (EPRI-NP—3912-SR-Vol.2, pp 103.1-103.8) **Time-dependent unavailability analysis - applications to safety systems.** Boccio, J.L.; Ginzburg, T.; Hall, R.E. (Brookhaven National Lab., Upton, NY). Feb 1985. Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303 $125.00. File Number TI85920542. (CONF-850206—Vol.2).

From International ANS/ENS topical meeting on probabilistic safety methods and applications; San Francisco, CA, USA (24 Feb 1985).

In this paper, examples of the applications of the FRANTIC II code are presented. The FRANTIC II code has been developed to augment engineering judgment, so that existing plant operational policies can be examined (and possibly optimized) from a plant safety standpoint. The analysis of periodic testing policies, and the effect of allowable outage times have been performed for an Emergency Feedwater System, an Automatic Depressurization System, and a High Pressure Coolant Injection System. The group of components which have a more profound influence on the reliability of each system has been identified.

39298 (EPRI-NP—3912-SR-Vol.2, pp 121.1-121.10) **Introduction of accidental procedures in the Event Trees of the 900 MW PWR PRA.** Bars, G.; Champ, M.; Lanore, J.; Pochard, R. Feb 1985. Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303 $125.00. File Number TI85920542. (CONF-850206—Vol.2).

From International ANS/ENS topical meeting on probabilistic safety methods and applications; San Francisco, CA, USA (24 Feb 1985).

In France a probabilistic risk assessment (PRA) is presently in progress in the Safety Assessment Department of CEA for a standardized 900 MW PWR plant. Indeed, the French safety approach for severe accidents management is the implementation of a set of special emergency procedures which identify the optimal actions even for out of design situations. So by accounting for these procedures (correctly or incorrectly applied) an important set of operator actions can be included in the PRA. This approach implies the introduction of the notion of procedure failure at the level of the Event Trees. Quantification of the corresponding probabilities leads to several problems as physical efficiency of the procedures, systems availability (including instrumentation), and human behavior. Among these problems the physics of the sequence is a primary question, both to state the efficiency of the procedure to prevent a core damage, and to assess the allowable time for the operator actions. So a set of thermohydraulic studies was initiated for various accident sequences and procedures. The authors present the example of the small LOCA Event Trees and the studies related to the introduction of procedure actions in case of HPSI failure. The results illustrate the interest of the approach and its significant impact on the PRA.

39299 (EPRI-NP—3912-SR-Vol.2, pp 129.1-129.3) **German offsite accident consequence model for nuclear facilities: further development and application.** Bayer, A. (Kernforschungszentrum Karlsruhe, West Germany). Feb 1985. Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303 $125.00. File Number TI85920542. (CONF-850206—Vol.2).

From International ANS/ENS topical meeting on probabilistic safety methods and applications; San Francisco, CA, USA (24 Feb 1985).

The German Offsite Accident Consequence Model - first applied in the German Risk Study for nuclear power plants with light water reactors - has been further developed with the improvement of several important submodels in the areas of atmospheric dispersion, shielding effects of houses, and the foodchains. To aid interpretation, the presentation of results has been extended with special emphasis on the presentation of the loss of life expectancy. The accident consequence model has been further developed for application to risk assessments for other nuclear facilities, e.g., the liquid metal fast breeder reactor (SNR-300) and the high temperature gas cooled reactor. Moreover the model have been further developed in the area of optimal countermeasure strategies (sheltering, evacuation, etc.) in the case of the Central European conditions. Preliminary considerations has been performed in connection with safety goals on the basis of doses.

39300 (EPRI-NP—4091) **Analysis of experimental data on condensation in an inverted U-tube. Final report.** Nguyen, Q.; Banerjee, S. (California Univ., Santa Barbara (USA). Dept. of Chemical and Nuclear Engineering). Jul 1985. 83p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920744.

Flow regimes and regime transitions in a single-inverted-U-tube condenser were investigated experimentally with a low pressure steam-water test system and a refrigerant-113 test system. From the data analysis, a flooding correlation was derived for the transition between reflux condensation and the oscillatory regime. The transition between the oscillatory regime and the carryover regime was also determined empirically based on the vapor velocity. The characteristics of each flow regime were presented with the results of all test runs. 17 refs., 8 figs., 3 tabs.

39301 (EPRI-NP—4146-SR) **EPRI R and D contributions to the technical basis for revision of ECCS rules.** Chexal, V.K.; Duffey, R.; Horowitz, J. (Electric Power Research Inst., Palo Alto, CA (USA)). Jul 1985. 61p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920749.

EPRI research efforts over the last ten years in the area of ECCS methodology are summarized. The results when added to those of the NRC and others provide a technical basis to show that the regulatory requirements in 10CFR50 Appendix K, are very conservative. In addition, these research efforts allow quantification of that conservatism. The research experiments, computer code development, and code assessment efforts funded by EPRI or cofunded with others are described.

39302 **(EUR—9167) Quantitative determination of impurities contained in the pressure vessel of the Garigliano reactor.** Peselli, M. (Commission of the European Communities, Luxembourg). 1984. 70p. (In Italian). NTIS (US Sales Only), PC A04/MF A01. File Number DE85701651.

For dismantling the vessel of the Garigliano power plant, an element of fundamental importance is the evaluation of the γ activity induced in structural materials by neutron activation. With this knowledge, the most adequate cutting techniques, protection system, transport devices and final disposal can be chosen, in order to reduce the risk to both workers and population, taking into account the economical point of views. In this report, the model used for the activity estimation and the obtained results, showing good agreement with some experimental data, are described. The task was performed in the following steps: - measurements of the vessel steel composition, - evaluation of neutron flux affecting the vessel, - evaluation of the activity due to neutron flux, - data inventory from activity measurement performed on in core irradiated vessel specimens, - comparison between measurement and calculation data.

39303 **(GEND—050) Three Mile Island technical information and examination program instrumentation and electrical summary report.** Meininger, R.D. (EG and G Idaho, Inc., Idaho Falls (USA)). Jul 1985. Contract AC07-76ID01570. 21p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015387.

This report summarizes the investigations on instrumentation and electrical systems that were subjected to a loss-of-coolant accident environment during and following the accident at Three Mile Island Unit-2 (TMI-2) on March 28, 1979. The report is a summary of information previously published in GEND-INF reports, plus current knowledge of the investigators.

39304 **(HEDL-SA—2179) Compensation techniques for improving pressure sensors accuracy during LOFT LOCA transient.** Billeter, T.R.; Wandling, C.R. (Hanford Engineering Development Lab., Richland, WA (USA)). Jun 1980. Contract AC06-76FF02170. 21p. NTIS, PC A02/MF A01. File Number TI85015481.

The fuel rod plenum gas pressure sensor for Loss-of-Fluid-Test (LOFT) exhibits measurement error during temperature variations as shown during development and qualification tests. Methods of reducing the error during transients have centered on providing thermal shields around the 500 kHz eddy current type transducer and on modifying the signal conditioning. A cylindrical copper enclosure around the transducer envelope proved more effective than an evacuated thin stainless steel tube for reducing transducer signal response to imposed temperature variations. Signal modification methods employing two excitation frequencies and detection by either amplitude or phase-sensitive techniques proved effective. Significant reductions of measurement error result from use of either of these signal compensation techniques. However, as compared with pressure as determined from the uncompensated signal, the technique using phase sensitive signal detection reduces absolute pressure measurement error by a factor of three and is more generally applicable. Consequently, that technique is recommended for analysis of signals from LOFT eddy current based preasure transducers. 1 ref., 10 figs.

39305 **(HEDL-SA—2262) Displacement measurement sensor for use in Loss-of-Fluid-Test reactor.** Billeter, T.R. (Hanford Engineering Development Lab., Richland, WA (USA)). Oct 1980. Contract AC06-76FF02170. 24p. (CONF-801103—46). NTIS, PC A02/MF A01 - GPO; GPO Dep. File Number TI85015347.

From IEEE nuclear science symposium; Orlando, FL, USA (5 Nov 1980).

Qualification tests conducted for a period of 700 hours of each of three displacement measuring (LVDT) sensors confirmed applicability of the design for use in the Loss-of-Fluid-Test (LOFT) reactor. Operationally, the sensor satisfies all specified requirements for LOFT. Even for imposed temperature transients at rates up to 100°F/s, the indicated displacement remained within the allowed maximum error band of +-10% of reading. The 0.625-inch O.D. by 5.5-inch long sensor exhibited a linearly related signal output variation for displacement variations of up to 1-inch range. Long term operation at temperatures of 100°F to 800°F caused no perceptible permanent change of operating characteristics. 8 refs., 14 figs.

39306 **(HEDL-SA—3224-FP) Role of FFTF in assessing structural feedbacks and inherent safety of LMR's.** Padilla, A.; Omberg, R.P.; O'Dell, L.D.; Harris, R.A.; Nguyen, D.H.; Waltar, A.E. (Hanford Engineering Development Lab., Richland, WA (USA)). Mar 1985. Contract AC06-76FF02170. 6p. (CONF-850410—55). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013736.

From ANS/ENS fast reactor safety meeting; Knoxville, TN, USA (21 Apr 1985).

The possibility of developing reactor designs with inherent safety characteristics sufficient to provide "walk away" safety is receiving additional emphasis in the LMR program. A key element in this effort is the recognition that LMR's possess safety characteristics above and beyond those employed in past safety review processes. Some of these additional safety characteristics are due to reactivity feedback effects caused by small structural movements during hypothetical severe design transients. The effect of these characteristics upon the behavior of the FFTF under such transients has been assessed and is discussed in this paper. The paper also presents a preliminary test matrix which might allow experimental verification of the structural reactivity feedback effects. Such experimental verification should be very useful to innovative designers seeking to optimize inherent safety. 8 refs., 1 fig., 2 tabs.

39307 **(HEDL-SA—3234-FP) CONACS: the DOE safety analysis system.** Martin, F.J.; Armstrong, G.R.; Niccoli, L.G. (Hanford Engineering Development Lab., Richland, WA (USA)). Mar 1985. Contract AC06-76FF02170. 8p. (CONF-850410—56). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013746.

From ANS/ENS fast reactor safety meeting; Knoxville, TN, USA (21 Apr 1985).

The CONtainment Analysis Code System (CONACS) is a large, comprehensive scientific simulation system for predicting conditions in an LMR facility following the occurrence of a postulated accident. It has now been developed to a stage of completion that can be referred to as a limited operational version. This version forms a permanent portion of the ultimate system. Because CONACS was developed with change in mind, it is now possible to draw on this strength to respond to changing requirements arising from advanced design concepts. The generalized design applications in the nuclear and non-nuclear fields and the quality assurance applied to the project make those adaptations reliable. In this paper the results of prototype tests and the implications of limited version tests are presented along with a brief description of CONACS and its relationship to LMR design optimization and cost reduction.

39308 **(HEDL-SA—3241-FP) Radiation and environmental protection experience at the Fast Flux Test Facility (FFTF).** Prevo, P.R.; Hess, D.O. (Hanford Engineering Development Lab., Richland, WA (USA)). 18 Apr 1985. Contract AC06-76FF02170. 9p. (CONF-850410—57). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013744.

From ANS/ENS fast reactor safety meeting; Knoxville, TN, USA (21 Apr 1985).

Radiological and environmental protection experience at the Fast Flux Test Facility (FFTF) has been excellent. Plant personnel radiation exposures have been very low, contamination has been readily controlled and releases of radioactivity to the environment have been essentially nonexistent. This report discusses these three aspects of fast reactor safety at the FFTF and covers the first five operating cycles. This represents a period of three years from 1982 through 1984. 4 refs., 2 figs., 3 tabs.

39309 **(HEDL-SA—3249-FP) SOCON: a computer model for analyzing the behavior of sodium-concrete reactions.** Nguyen, D.G.; Muhlestein, L.D. (Hanford Engineering Development Lab., Richland, WA (USA)). Mar 1985. Contract AC06-76FF02170. 8p. (CONF-850410—54). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013734.

From ANS/ENS fast reactor safety meeting; Knoxville, TN, USA (21 Apr 1985).

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Guided by experimental evidence available to date, ranging from basic laboratory studies to large scale tests, a mechanistic computer model (the SOCON model) has been developed to analyze the behavior of SOdium-CONcrete reactions. The model accounts for the thermal, chemical and mechanical phenomena which interact to determine the consequences of the reactions. Reaction limiting mechanisms could be any process which reduces water release and sodium transport to fresh concrete; the buildup of the inert reaction product layer would increase the resistance to sodium transport; water dry-out would decrease the bubble agitation transport mechanism. However, stress-induced failure of concrete, such as spalling, crushing and cracking, and a massive release of gaseous products (hydrogen, water vapor and CO_2) would increase the transport of sodium to the reaction zone. The results of SOCON calculations are in excellent agreement with measurements obtained from large-scale sodium-limestone concrete reaction tests of duration up to 100 hours conducted at the Hanford Engineering Development Laboratory. 8 refs., 7 figs.

39310 **(IDO—1570-T6) LOFT monthly progress report for February 1979.** (EG and G Idaho, Inc., Idaho Falls (USA)). Mar 1979. Contract AC07-76ID01570. 62p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85015485.

During February, the LOFT program continued a major replanning effort for FY-1979. That effort culminated at month end in a proposed new baseline program, designated Q11. That baseline plan calls for LOCE tests L2-3 and L2-5 in May and October, respectively. Both tests will be conducted at a maximum linear heat rate of 12 kW/ft, and a changeout of the center fuel module is planned after each. Significant work item adjustments were required to accommodate the six-month program advance implicit in this plan, particularly as the result of the now planned mid-summer fuel replacement and associated preparations. Also during February, mid-year reviews were held at NRC offices in Silver Springs, Maryland, and work on detailed planning for FY-1980 and 1981 began. That planning effort will continue in March. This monthly report is the first to incorporate some revisions in content and format as the result of reviews of prior year documents and problems in their preparation. It is hoped that these changes will improve the understanding of program position. It should also be noted that the budget information and schedules contained herein reflect the new Q11 baseline.

39311 **(IKE—2-69) Experimental investigations at small spheres for the determination of influences on the heat transfer and the heat destorage times in case of quenching.** Fiedler-Poehlmann, A. (Stuttgart Univ. (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme). Feb 1985. 182p. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE85752022.

This work presents heat transfer data obtained with quenching experiments. These experiments were made with spherical metal bodies with diameters between 0.45 mm and 15 mm, which were rapidly dumped into subcooled water and had initial temperatures of up to 1100°C. For pool boiling conditions the existence of a linear dependence between the two extreme heat flux densities and the water subcooling, respectively, could be confirmed. The correlations available in literature are usually applicable on other geometries, other liquids and saturated liquid. They correspond to the here experimentally derived heat transfer data as a function of the sphere diameter insufficiently. Here proposals for modifications are made. By applying shock waves on the vapour layer, a well defined and in some cases most effective influence on the boiling process could be achieved. The effectiveness of this method was dependent on the choice of the heater metal, water temperature and the amplitude of the shock wave. This was shown by the shock wave induced enhancement of the heat flux density, obtained at high temperatures of the sphere. The mean value of the heat flux density of the whole quenching process could also be raised considerably. This increase could reach more than the tenfold of the value measured under pool boiling conditions without disturbance of the boiling process. Literature gives only poorly comparable data (differences in the shape of the shock waves, ambient pressure, subcooling). Extensively could be shown, that under favourable conditions the vapour layer can reestablish after application of the shock wave.

39312 **(INIS-BR—260, pp 454-469) Concept and design of shielding for nuclear power plants with pressurized water reactors: application for a NUCLEN case.** Dias, W.B. (NUCLEN, Rio de Janeiro (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The criteria, as well as the most important methods used at NUCLEN (NUCLEBRAS Engenharia S/A) to assure an adequated personnel radiological protection are presented. The criteria adopted, aim to minimize the individual dose and the methods were chosen to obtain reliable results in a simple and objective way based in empirical data from KWU nuclear power plants in operation.

39313 **(INIS-BR—260, pp 206-215) Project of a binary breeder reactor and its inherent safety.** Nascimento, J.A. do; Dias, A.F.; Ishiguro, Y. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Estudos Avancados). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

A core layout for the binary breeder reactor (BBR) is developed based on the results of preliminary burnup calculations. The apparent breeding ratio, in the U^{233}/Th fueled inner core, is low due to the accumulation of Pa-233 in the first few months of operation. The loss of reactivity during this time is around 3%. The BBR requires more reactivity control than Pu/U-fueled LMFBRs and the core layout developed has 19 control rod assemblies in the inner core. Three aspects related to the inherent safety of the Binary Breeder Reactor have been studied: the radial distribution of the sodium-void reactivity zone-wise Doppler reactivity and the fractions of delayed neutrons. The results show excellent characteristics for the BBR safety.

39314 **(INIS-BR—260, pp 298-312) Verification of SACI-2 computer code compared with experimental results of Biblis-A and Loop-7 computer code.** Soares, P.A.; Sirimarco, L.F. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

SACI-2 is a computer code created to study the dynamic behaviour of a PWR nuclear power plant. To evaluate th quality of its results, SACI-2 was used to recalculate commissioning tests realized in the Biblis-A nuclear power plant and to calculate postulated transients for Angra-2 reactor. The results of Saci-2 obtained experimentally for Biblis-A showed as much good agreement as those calculated with the KWU Loop-7 computer code for Angra-2.

39315 **(INIS-mf—9298) Probabilistic fracture mechanics. Method and application to the steel containment shell of a PWR-type reactor.** Haeberer, R. (Karlsruhe Univ. (T.H.) (Germany, F.R.). Fakultaet fuer Maschinenbau). 12 Dec 1983. 106p. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781348.

The thesis is subdivided into two parts. To start off with, the method is shown in general. The question is raised what the purpose of probabilistic fracture mechanics is. In this context some of the problems underlying this method are dealt with. The influence of the fact that curves need to be adapted to rough data on the reliability are of particular interest. Part two of this study describes how a theory developed in the course of part one is applied to a real component, i.e. the steel containment shell of PWR-type reactors. At first, the failure probability of the component is determined. Based on relative statements and a study of parameters, an investigation was carried out to find out what degree the calculated failure probabilities can be relied on.

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39316 (INIS-mf—9479, pp 3-10) **Operational safety related human engineering research in Finland.** Haapanen, P.; Wahlstroem, B. (Valtion Teknillinen Tutkimuskeskus, Helsinki (Finland)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

Human errors contribute considerably to the total risk of the nuclear power plants as was clearly demonstrated at the TMI-accident in 1979. This fact was recognized early in Finland and a comprehensive research program was established in the second half of the 1970s. This paper gives a short description of some research projects in this program.

39317 (INIS-mf—9479, pp 11-20) **Implementation of safety parameter display systems in Belgian nuclear power plants.** Binnebeek, J.J. van (Association VINCOTTE, Brussels (Belgium)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

The safety parameter display systems designed for the Belgian nuclear power plants can be classified into two categories: the first one puts the emphasis upon the interrelationship between the physical systems in order to make the accidents diagnostics more straightforward; the second one gathers the various parameters of the plant in such a way that it can be easily assessed so that the NSAC basic safety objectives are met during normal and abnormal plant conditions.

39318 (INIS-mf—9479, pp 21-31) **Reduction of alarm messages in nuclear power plant control room.** Kukko, T.; Rinttilae, E.; Makkonen, L. (Imatran Voima Oy, Helsinki (Finland)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

A universal problem in nuclear power plant control room operation is the excessive amount of alarm information at great process disturbances. IVO examined possibilities to restrict the amount of alarms in its Loviisa nuclear power station. This paper deals with the methods applied in the examination and the results of it, which indicate that most alarms occurring in big transients can be suppressed without losing any necessary process information.

39319 (INIS-mf—9479, pp 71-84) **Fault location using digraph with application to boiling water reactor.** Kokawa, Masasumi; Miyazaki, Satoshi; Shingai, Sadanori (Hitachi Ltd., Kawasaki, Kanagawa (Japan). Systems Development Lab.); Murata, Fumio (Hitachi Ltd., Ibaraki (Japan). Nuclear Power Generation Div.); Hashimoto, Shigeo (Hitachi Ltd., Ibaraki (Japan). Omika Works). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

A fault location method based on the graph approach is proposed. The method can deal with failure propagation time and failure propagation probability. Several candidates for failure origin are shown in the digraph. The priority ranking among the candidates is evaluated taking into account propagation probability and failure rate. This method is applied to the primary loop recirculation system of boiling water reactors. How effectively failure origin in an abnormally functioning system can be identified through the application of this method is examined.

39320 (INIS-mf—9479, pp 85-93) **Programming the diagnosis logic by means of the conversational graphic input to the CRT display device.** Kato, A.; Tsuji, H. (Mitsubishi Electric Corp., Kamakura, Kanagawa (Japan). Computer Systems Works); Okamoto, Y. (Mitsubishi Electric Corp., Kobe (Japan). Power and Industrial Systems Center). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

A plant diagnostic method using Cause Consequence Tree (CCT) has been recognized as a powerful means to identify and analyze plant fault events. The off-line support program called the 'CCT diagram editor' was developed and it could generate the computer object program by inputting the CCT diagram itself using the CRT display, tablet and key-board just as the computer aided design (CAD). The CCT diagram editor has improved the problems of the programming error, difficulty of correction or modification and productivity of the program. The system can be used also for safety analysis of nuclear power plants.

39321 (INIS-mf—9479, pp 95-108) **Design evaluation of diagnostic method and display method for PWR plant computerized operator support system (COSS) in Japan.** Masui, T.; Yokoyama, T. (Mitsubishi Atomic Power Industries, Inc., Tokyo (Japan)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

PWR plant computerized operator support system (COSS) in Japan has been developing as 5 years project. This COSS is finally going to validate with PWR plant full scale simulator. This paper describes the evaluation of following items in developing stage: diagnostic logic reliability, diagnostic functions for operator's aid, COSS failure and display method.

39322 (INIS-mf—9479, pp 123-131) **PWR plant diagnosis method by reference models.** Tani, M.; Morimoto, H.; Fujwara, T. (Mitsubishi Heavy Industries Ltd., Tokyo (Japan)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

This paper describes the structure and the performance of the abnormality diagnosis system. The proposed abnormality diagnosis method provides the dynamic model of the plant represented by the equations based on the laws of mass and energy conservation, etc. as the reference in the plant behaviour, and diagnoses the abnormal points by comparing the measured values in the actual plant with the output values of the corresponding model.

39323 (INIS-mf—9479, pp 133-148) **Abnormal event operator aids in CANDU nuclear power stations.** Pauksens, J.; Popovic, J.R. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. CANDU Operations). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

From the first commercial prototype CANDU reactor at Douglas Point, CANDU designs have made use of digital computers for station control and operator information functions. In this paper alarm annunciation and display systems in CANDU 600 MW stations now in service are described with particular reference to features that ensure the operator is not overwhelmed with so much data that he is unable to distinguish the major alarms. Development work is also described on an automated Abnormal Incident Decision Support (AIDS) System which is an aid to the operator for accident conditions.

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39324 (INIS-mf—9479, pp 149-162) **Fault modelling and verification methods used for automated failure analysis in Paks NPP.** Hollo, E.; Czako, S. (Villamosenergiaipari Kutato Intezet, Budapest (Hungary)); Janosy, S.J. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

During the initial operational work of the first unit of Paks WWER-440 NPP the failure and disturbance modelling of its technological equipment and systems has received attention of considerable significance. At the Institute of Electrical Power Research (VEIKI) and Central Research Institute for Physics (KFKI) a joint R/D program on fault modelling and verification has been carried out since 1979. In the present paper the main directives of work performed are described. Special attention is given to failure mode and effect analysis, discrete and continuous model forms, as well as failure event sequence determination. Verification of failure models was performed by continuous dynamical simulation. During continuous simulation several failure event sequences were generated.

39325 (INIS-mf—9479, pp 163-172) **PANDA - program system for post-mortem disturbance analysis.** Buerger, L.; Szegi, Zs. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

A program system for analysis of the causes of plant disturbances after their occurences was developed for the Paks nuclear power plant. A fault tree is generated from the component failure models and is evaluated taking into account the states and parameter values measured during the disturbance.

39326 (INIS-mf—9479, pp 173-189) **CANDU alarm sequence analysis following abnormal incidents.** Gumley, P.; Narayanan, P.S.; Smith, J. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. CANDU Operations). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

In setting the requirements for the capability of the safety and safety support systems, analysis of reactor plant transients following abnormal incidents has traditionally used worst case conditions and assumptions. This paper reviews some typical event sequencies and the expected response of the station alarms and indications. Details of the alarm and indication analyses are presented in developing operator cues from the event sequences. The analyzed sequences are scrutenized for commonness of alarms and confirmatory checks are proposed to enable an accurate diagnosis of the initiating process failure and resultant plant conditions. The paper concludes with a brief description of how the information contained in event sequences could be developed into event sequence alarm diagrams in a form suitable for the future anomaly identification and operator support system being developed at AECL.

39327 (INIS-mf—9479, pp 291-301) **Accuracy and the accident qualification of a subcooled margin monitor for PWRs.** Kaiser, G.E. (Brown, Boveri und Cie A.G., Mannheim (Germany, F.R.)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

The subcooled margin monitor is a well known information system in a safety related category of PWR information and control system. There are some possibilities to qualify its instruments for accident conditions inside the containment. An example for inaccuracy calculation is given.

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39328 (INIS-mf—9479, pp 303-314) **Approach for a microprocessor-based surveillance system for a fast breeder reactor.** Glauner, W. (Projektgesellschaft Schneller Brueter G.b.R., Essen (Germany, F.R.)); Voges, U. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Datenverarbeitung in der Technik). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

Cooling disturbances within the core of a fast breeder reactor are a major concern for safety considerations. A fault propagation diagram was set up and the potential of different individual detection methods was investigated. Future efforts are directed towards a probabilistic evaluation of the failure propagation and an attempt to combine the signals from different detection methods into a more sensitive early failure detection system. The realization will be done by microprocessors.

39329 (INIS-mf—9479, pp 315-325) **Methodology for functional testing of protection and control systems of nuclear power plants. Development of the code CAPTA.** Izquierdo, J.M.; Gil, E.; Hortal, J. (Consejo de Seguridad Nuclear, Madrid (Spain)). 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781346. (CONF-8310374—).

From Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions; Balatonaliga, Hungary (4 Oct 1983).

The functional testing of protection channels emphasizes generally the correct adjustment of comparator set points that generates protection initiation signals, but operational methodology avoids correct testing of gains and time constants. It is important to develop tools and procedures to perform a rapid diagnostics of any software failure of this type. This paper describes such a tool developed by the PWR startup testing group of the authors' institute.

39330 (INIS-mf—9482, pp 90) **Czechoslovak thermoluminescence dosimetry system for nuclear power facilities.** Plichta, J. (Vyzkumny Ustav Energeticky, Prague (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

39331 (INIS-mf—9519) **Safety assurance for nuclear chemical plants - regulatory practice in the UK.** Driscoll, J.; Charlesworth, F. (International Nuclear Law Association (INLA), Brussels (Belgium)). 1983. 17p. (CONF-8309278—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781358.

From Nuclear inter jura '83; San Francisco, CA, USA (11 Sep 1983).

This paper describes the legislation and licensing requirements for nuclear installations as well as the related safety assurance procedures in the UK. Developments in safety assurance practice are identified and discussed in relation to the role of the regulator and of the operator.

39332 (INIS-mf—9520) **Comparative study of legal limits of safety requirements for nuclear installations.** Schattke, H. (International Nuclear Law Association (INLA), Brussels (Belgium)). 1983. 84p. (CONF-8309278—6). NTIS (US Sales Only), PC A05/MF A01. File Number DE85781400.

From Nuclear inter jura '83; San Francisco, CA, USA (11 Sep 1983).

This paper makes a detailed analysis of safety philosophies and principles of radiological protection at international and national levels according to a standardised plan for purposes of comparison. It describes the relevant regulations of the IAEA, OECD/NEA and Euratom and those of the US, UK, France, Italy, the Netherlands, Switzerland and the Federal Republic of Germany. The author points out that the ICRP recommendations are the guidelines in the radiation protection field.

39333 **(INIS-mf—9521) Administrative requirements of financial securities to cover decommissioning operations.** Sanchez, J.L. (International Nuclear Law Association (INLA), Brussels (Belgium)). 1983. 5p. (In Spanish). (CONF-8309278—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781359.

From Nuclear inter jura '83; San Francisco, CA, USA (11 Sep 1983).

This paper points out that the lack of experience in decommissioning of nuclear power plants is reflected by the absence of specific legislation regarding the economic, fiscal and accounting aspects of the process. The author suggests that a fund be created for decommissioning costs through contributions deriving from plant operation. The paper analyses the procedures to be followed and draws attention to the need for clear legislation on decommissioning.

39334 **(INIS-mf—9530) Nuclear Safety.** (British Nuclear Forum, London). Sep 1978. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781354.

In this short paper it has only been possible to deal in a rather general way with the standards of safety used in the UK nuclear industry. The record of the industry extending over at least twenty years is impressive and, indeed, unique. No other industry has been so painstaking in protection of its workers and in its avoidance of damage to the environment. Headings are: introduction; how a nuclear power station works; radiation and its effects (including reference to ICRP, the UK National Radiological Protection Board, and safety standards); typical radiation doses (natural radiation, therapy, nuclear power programme and other sources); safety of nuclear reactors - design; key questions (matters of concern which arise in the public mind); safety of operators; safety of people in the vicinity of a nuclear power station; safety of the general public; safety bodies.

39335 (INIS-mf—9532, pp 55-60) **REMAND. Computer code for calculations of reactor accidents consequences.** Stern, E.; Covaliu, Z.; Kaufman, Y.; Stark, M. (Israel Atomic Energy Commission, Tel Aviv. Licensing Div.). 1983. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780892. (CONF-831241—Summ.).

From Joint US/Israeli meeting on safety and siting problems for power reactors in a small country; Haifa, Israel (20 Dec 1983).

Published in summary form only.

39336 (INIS-mf—9532, pp 98) **Need for training senior technical and managerial personnel in applying PRA methods.** Budnitz, R.J. (Future Resources Associates, Inc., Berkeley, CA (USA)). 1983. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780892. (CONF-831241—Summ.).

From Joint US/Israeli meeting on safety and siting problems for power reactors in a small country; Haifa, Israel (20 Dec 1983).

Published in summary form only.

39337 **(INIS-mf—9641) Commissioning a major retro fit in an existing nuclear power station.** Whelan, D.J. (Ontario Hydro, Tiverton (Canada). Bruce Nuclear Generating Station-A). May 1983. 10p. (CONF-8305259—10). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781425.

From Canadian Nuclear Society commissioning symposium; Toronto, Ontario, Canada (3 May 1983).

The low pressure emergency core injection (ECI) system at Bruce NGS 'A' is being replaced by a new high pressure system. The new system is similar to that being installed in the Bruce NGS 'B' plant which is scheduled to start up later this year. The new system at Bruce NGS 'A' will be connected to Unit 4 in April 1984, and the other units will be converted at six monthly intervals. Commissioning activities are well under way and it is apparent that there are significant differences between commissioning a major retro fit in an existing station, compared with commissioning a whole new project.

39338 (INIS-mf—9644, pp 11-38) **Comparison of industrial risks.** Wilson, R.; Chase, W.J. (Ontario Hydro, Toronto (Canada)). 1983. NTIS (US Sales Only), PC A08/MF A01. File Number DE85781436. (CONF-8211206—).

From Seminar on uranium and nuclear issues; Toronto, Ontario, Canada (2 Nov 1982).

Three measures of occupational risk in industry are discussed: fatal accident rate, standardized mortality ratio and loss of life expectancy. Fatal accident rates vary widely in Canadian and Ontario industries and occupations, and the most dangerous occupations are about 50 times riskier than the average. Standardized mortality ratios also vary widely for different diseases and occupations. Some of the variation is caused by social class differences, but when this is accounted for, a difference of ten years in life expectancy between the safest and riskiest British occupations still remains. Information on the differences in occupational risks, along with the knowledge of the costs associated with the reduction in the risks, enables rational decisions to be made in the allocation of limited resources.

39339 **(INIS-mf—9664) Ordinance of 5 December 1983 concerning funds for the decommissioning of nuclear installations.** (International Atomic Energy Agency, Vienna (Austria)). 5 Dec 1983. 6p. (In French). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781430.

This Ordinance (RS 732.013) which entered into force on 1 January 1984 establishes a fund for the financing of decommissioning activities which was provided for by the Federal Order of 1978 concerning the Atomic Energy Act. This fund is destined to finance these operations. Nuclear operators are obliged to make annual contributions which are calculated to cover the costs which each one of them expects to encounter at the time of decommissioning.

39340 **(INIS-mf—9684) Regulations for pressurized component safety in nuclear power plants.** (Swedish Nuclear Power Inspectorate, Stockholm; Swedish Plant Inspectorate, Stockholm). Oct 1984. 293p. NTIS (US Sales Only), PC A13/MF A01. File Number DE85781495.

The Swedish government issues a permit to a nuclear power plant owner for operating the plant. As a conditions for the permit, safety regulations must be applied. FTK (this issue) includes new rules or replaces old ones. They have been issued January 20, 1984 and are applicable beginning on October 1, 1984. The rules are applicable for the design purchase, manufacture, installation and repair of components and systems in nuclear power plants with respect to pressurized component safety. (G.B.).

39341 **(ISD—306) Response of a reactor building due to detonation of flat layered gas clouds.** Frik, G. (Stuttgart Univ. (Germany, F.R.). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen). May 1984. 144p. (In German). NTIS (US Sales Only), PC A07/MF A01. File Number DE85752028.

The stress of the containment of a PWR plant of today is calculated for the loading of three detonating flat layered gas clouds. The dynamic response of the structure due to the blast wave is determined and comparisons are made with previous results of the detonating stochiometric gas cloud and with results of the individual task 11A (GRS). The calculations were realized with the method of modal superposition and linear elastic material laws. The stress conditions of the structure were comprehended by three loading cases of the flat, layered gas clouds. The first loading case B(a) leads to high stresses, which are not interpretable with a linear analysis. On the other hand, the loading case B(b) leads to stresses which are not much above and B(c) to stresses which are not much below the yield stress. It is demonstrated for a linear analysis, that the structure will not be injured by the detonation wave of case B(c).

39342 **(JAERI-M—84-050) SPEEDI: system for prediction of environmental emergency dose information.** Chino, Masamichi; Ishikawa, Hirohiko; Kai, Michiaki. (Japan Atomic Energy Research Inst., Tokyo). Mar 1984. 84p. (In Japanese). NTIS (US Sales Only), PC A05/MF A01. File Number DE85701642.

In this report a computer code system for prediction of environmental emergency dose information , i.e., SPEEDI for short, is presented. In case of an accidental release of radioactive materials

from a nuclear plant, it is very important for emergency planning to predict the concentration and dose caused by the materials. The SPEEDI code system has been developed for this purpose and it has features to predict by calculation the released nuclides, wind fields, concentrations and dose based on release information, actual weather and topographical data.

39343 **(JAERI-M—84-100) Recirculation pump suction line 2.8% break integral test at ROSA-III with HPCS failure, RUN 984.** Suzuki, Mitsuhiro; Anoda, Yoshinari; Tasaka, Kanji; Kumamaru, Hiroshige; Nakamura, Hideo; Yonomoto, Taisuke; Murata, Hideo; Shiba, Masayoshi. (Japan Atomic Energy Research Inst., Tokyo). Jun 1984. 213p. NTIS (US Sales Only), PC A10/MF A01. File Number DE85701652.

This report presents the experimental data of 2.8% suction line break test RUN 984 at ROSA-III, which was conducted as one of counterpart tests to FIST program sponsored by GE, EPRI and USNRC. The similarity study between the ROSA-III and FIST tests is on the way. The report also presents the information on the ROSA-III test facility, experiment results and the effects of the ADS flow rate and the MSIV trip level comparing with the previously conducted ROSA-III small break tests, RUNs 920 and 922. Major conclusions obtained are as follows. (1) Change of the MSIV trip level from L2 to L1 gives delay of MSIV closure and longer actuation of pressure control system in a small break LOCA. (2) Larger ADS flow gives faster depressurization rate and earlier ECCS actuation, which results in shorter fuel rod dryout period and lower PCT.

39344 **(KFK—3800) Proceedings of the CSNI specialist meeting on nuclear aerosols in reactor safety.** Schikarski, W.O.; Schoeck, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Lab. fuer Aerosolphysik und Filtertechnik 1; Nuclear Energy Agency, 75 - Paris (France). Committee on the Safety of Nuclear Installations). Feb 1985. 566p. (CONF-8409112—; CSNI—95). Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Lab. fuer Aerosolphysik und Filtertechnik 1.

From CSNI specialist meeting on aerosols in reactor safety; Karlsruhe, F.R. Germany (4 Sep 1984).

The prediction of the release and transport of nuclear aerosols associated with postulated accidents in nuclear power plants is necessary for the assessment of the radiological consequences of these accidents and hence is an important aspect of reactor safety evaluation. The nature and behavior of nuclear aerosols can potentially influence both the course and the consequences of reactor accidents. For example, nuclear aerosols can affect the performance of engineered safety systems (e.g. containment, air cleaning systems) as well as the magnitude, dispersion and effects of the radioactive source term leaked to the atmosphere. As a result of the extreme environment associated with nuclear aerosols, they exhibit very dynamic physical and chemical behavior and pose special analytical and experimental problems different from those associated with aerosols found unter industrial and ambient conditions. The purpose of the Meeting was to discuss the conclusions of the Review in depth and provide a forum for the exchange of information between aerosol research specilists, reactor designers, and regulators regarding the realistic assessment of radiological consequences of reactor accidents in LWRs, LMFBRs, and GCRs. Emphasis was placed on the technical aspects of the subject and on new information beyond the Proceedings of the Gatlinburg Meeting (NUREG/CR-1724, ORNL/NUREG/TM-404, CSNI-45, October 1980) and the State-of-the-Art Review, particularly in the field of severe LWR accidents.

39345 **(LA-UR—81-1507) Effects of early pump trip on the time-to-core uncovery for a TMI-type accident.** Ireland, J.R. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 14p. (CONF-810806—2). NTIS, PC A02/MF A01. File Number TI85015349.

From ANS conference on small break loss of coolant accident analysis in LWR's; Monterey, CA, USA (25 Aug 1981).

This article summarizes thermal-hydraulic analyses performed with the Transient Reactor Analysis Code (TRAC) pertaining to one aspect of the pumps on/pumps off question for small breaks in pressurized water reactors (PWRs). In addition to the base case (pumps on) calculation, which reproduced the initial part of the Three Mile Island (TMI) accident, parametric calculations were performed to determine the effects of pumps on/pumps off for a TMI-type accident in which the break is located at the top of the pressurizer through the power-operated relief valve (PORV). The results of these calculations show that for the pumps-off case, core uncovery will occur approximately one hour sooner than the pumps-on case. The main reason for the earlier core uncovery for the pumps-off is a larger PORV flow rate calculated as a result of a high calculated system pressure. Therefore, based on this analysis, the primary system pumps should be left running as long as possible for a TMI-type accident. 4 refs., 10 figs.

39346 **(MIT-EL—84-011) TITAN: an advanced three-dimensional coupled neutronic/thermal-hydraulics code for light water nuclear reactor core analysis.** Griggs, D.P.; Kazimi, M.S.; Henry, A.F. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). Jun 1984. 510p. NTIS, PC A22/MF A01. File Number DE85901890.

The three-dimensional nodal neutronics code QUANDRY and the three-dimensional two-fluid thermal-hydraulics code THERMIT are combined into TITAN. Steady-state and transient coupling methodologies based upon a tandem structure were devised and implemented. Additional models for nuclear feedback, equilibrium xenon and direct moderator heating were added. TITAN was tested using a boiling water two channel problem and the coupling methodologies were shown to be effective. Simulated turbine trip transients and several control rod withdrawal transients were analyzed with good results. Sensitivity studies indicated that the time-step size can affect transient results significantly. TITAN was also applied to a quarter core PWR problem based on a real reactor geometry. The steady-state results were compared to a solution produced by MEKIN-B and poor agreement between the horizontal power shapes was found. Calculations with various mesh spacings showed that the mesh spacings in the MEKIN-B analysis were too large to produce accurate results with a finite difference method. The TITAN results were shown to be reasonable. A pair of control rod ejection accidents were also analyzed with TITAN. A comparison of the TITAN PWR control rod ejection results with results from coupled point kinetics/thermal-hydraulics analyses showed that the point kinetics method used (adiabatic method for control rod reactivities, steady-state flux shape for core-averaged reactivity feedback) underpredicted the power excursion in one case and overpredicted it in the other. It was therefore concluded that point kinetics methods should be used with caution and that three-dimensional codes like TITAN are superior for analyzing PWR control rod ejection transients.

39347 **(ND-R—814(S)Pt.3) CANSWEL-2: a computer model of the creep deformation of Zircaloy cladding under loss-of-coolant accident conditions.** Haste, T.J. (UKAEA Risley Nuclear Power Development Establishment). Apr 1984. 26p. H.M. Stationery Office, London, price Pound 4.00.

An option has been introduced into the CANSWEL-2 code to allow the modelling of internal pressure changes which occur in a fuel rod during a ballooning transient. Account in taken of fuel pellet thermal expansion and of the presence of a plenum, whose temperature may remain fixed, or follow a nodal temperature history. Either hot or cold pressures may be specified. Temperature drops on ballooning may be modelled approximately using a read-in 'lift-off' factor. The mechanical restraint model has been extended to improve the simulation of interaction in small bundle experiments. The onset of rod flattening may optionally be delayed beyond the point at which the centre rod becomes trapped by its neighbours; the rods push themselves apart until the overall extent of the 3 x 3 array exceeds user defined limits. At this time the rods begin to assume non-circular shapes. The materials properties library has been enlarged to include recent CEGB recommended creep data for Zircaloy-4 from different manufacturers. The new options extend the scope for possible applications of the code. Notes are provided on changes to the input data, and examples illustrating the new options are included.

39348 **(NEDO—10723) Hydrogen generation and the General Electric Boiling Water Reactor.** Wilson, R.M.; Slifer, B.C. (General Electric Co., San Jose, CA (USA). Atomic Power Equipment Dept.). Feb 1973. 24p. General Electric Co., Nuclear Division, San Jose, CA 95125. File Number TI85901850.

This report presents a complete chronological history and current status of hydrogen generation, flammability, and control associated with the General Electric Boiling Water Reactor. Safety Guide 7 assumptions are reviewed and related to current state-of-the-art in such areas as extent of metal-water reaction, radiolytic hydrogen generation rate, core decay energy deposition, and flammability limits. A review of risks versus benefits derived from inerting of the containment atmosphere is presented. Also reviewed are the several concepts which are being considered as feasible alternatives to effectively control hydrogen. 18 refs., 11 figs.

39349 **(NUREG—0798-Suppl.6) Safety Evaluation Report related to the operation of Fermi-2 (Docket No. 50-341). Supplement No. 6.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Jul 1985. 55p. NTIS, PC A04/MF A01 - GPO. File Number TI85901852.

Supplement No. 6 to the Safety Evaluation Report (SER) related to the operation of the Fermi-2 facility, provides the NRC staff's evaluation of additional information submitted by the licensee regarding outstanding review issues identified in Supplement No. 5 to the SER dated March 1985 and also contains the staff's evaluation of the Independent Design Verification Program. Supplement No. 6 to the SER also summarizes the conditions which are placed in the Fermi-2 full-power operating license, NPF-43, and evaluates recent proposed changes to the Fermi-2 Technical Specifications. This supplement presents the staff's conclusion that there are no outstanding issues which must be resolved prior to issuance of a full power operating license for the Fermi-2 facility.

39350 **(NUREG—0991-Suppl.5) Safety Evaluation Report related to the operation of Limerick Generating Station, Units 1 and 2 (Docket Nos. 50-352 and 50-353). Supplement No. 5.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Jul 1985. 50p. NTIS, PC A03/MF A01 - GPO. File Number TI85901848.

In August 1983 the NRC issues its Safety Evaluation Report regarding the application for licenses to operate the Limerick Generating Station, Units 1 and 2 located on a site in Montgomery and Chester Counties, Pennsylvania. Supplement 1 was issued in December 1983 and addressed several outstanding issues. SSER 1 also contains the comments made by the Advisory Committee on Reactor Safeguards in its interim report dated October 18, 1983. Supplement 2 was issued in October 1984. Supplement 3 was issued in October 1984 and addressed the remaining issues that required resolution before issuance of the operating licence for Unit 1. On October 26, 1984 a license (NPF-27) for Unit 1 was issued which was restricted to a five percent power level and contained conditions which required resolution prior to proceeding beyond the five percent power level. Supplement 4 issued in May 1985 addressed some of the technical issues and their associated license conditions, which required resolution prior to proceeding beyond the five percent power level. SSER 4 also contained the comments made by the Advisory Committee on Reactor Safeguards in its report dated November 6, 1984. This Supplement 5 to the SER addresses further issues that require resolution prior to proceeding beyond the five percent power level.

39351 **(NUREG—1128) Trial evaluations in comparison with the 1983 safety goals.** Riggs, R.; Sege, G. (Nuclear Regulatory Commission, Washington, DC (USA). Div. of Safety Technology). Jun 1985. 196p. NTIS, PC A09/MF A01 - GPO. File Number TI85901734.

This report provides retrospective comparisons of selected generic regulatory actions to the 1983 NRC safety goals, which had been issued for evaluation during a two-year period. The issues covered are those analyzed by the Office of Nuclear Reactor Regulation (NRR) (assisted in some cases by the Battelle Pacific Northwest Laboratory). The issues include auxiliary feedwater reliability, pressurized thermal shock, power-operated relief valve isolation, asymmetric blowdown loads on PWR primary systems, pool dynamic loads for BWR containments, and steam generator tube rupture. Calculated core-melt frequencies, mortality risks, and cost-benefit ratios are compared with the corresponding safety-goal quantitative design objectives. Considerations that should influence interpretation of the comparisons are discussed. Comments are included on whether and how the safety goals may have helped in the regulatory decision process and on problems encountered.

39352 **(NUREG—1148) Nuclear Power Plant Fire Protection Research Program.** Datta, A. (Nuclear Regulatory Commission, Washington, DC (USA). Div. of Engineering Technology). Jul 1985. 28p. NTIS, PC A03/MF A01 - GPO. File Number TI85901873.

The goal is to develop test data and analytical capabilities to support the evaluation of: (1) the contribution of fires to the risk from nuclear power plants; (2) the effects of fires on control room equipment and operations; and (3) the effects of actuation of fire suppression systems on safety equipment. A range of fire sources will be characterized with respect to their energy and mass evolution, including smoke, corrosion products, and electrically conductive products of combustion. An analytical method for determining the environment resulting from fire will be developed. This method will account for the source characteristics, the suppression action following detection of the fire, and certain parameters specific to the plant enclosure in which the fire originates, such as the geometry of the enclosure and the ventilation rate. The developing local environment in the vicinity of safety-related equipment will be expressed in terms of temperatures, temperature rise rates, heat fluxes, and moisture and certain species content. The response of certain safe shutdown equipment and components to the environmental conditions will be studied. The objective will be to determine the limits of environmental conditions that a component may be exposed to without impairment of its ability to function. (ACR)

39353 **(NUREG/CR—3638) Hydrogen-steam jet-flame facility and experiments.** Shepherd, J.E. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1985. Contract AC04-76DP00789. 125p. (SAND—84-0060). NTIS, PC A06/MF A01 - GPO; GPO Dep. File Number TI85015372.

As part of NRC-sponsored research on light-water reactor safety, the high-temperature combustion of steam-hydrogen jets in an air atmosphere is being investigated at Sandia. This research is oriented at understanding the generic issues involved in accident-generated jets and the specific problems of using deliberate flaring from high-point vents to eliminate hydrogen from the primary system. In this report we give some background on diffusion-flame combustion, describe the experimental facility constructed at Sandia to study high-temperature, steam-hydrogen jets and discuss our results.

39354 **(NUREG/CR—3660-Vol.1) Probability of pipe failure in the reactor coolant loops of Westinghouse PWR Plants. Volume 1. Summary report.** Holman, G.S.; Chou, C.K. (Lawrence Livermore National Lab., CA (USA)). Jul 1985. Contract W-7405-ENG-48. 102p. (UCID—19988-Vol.1). NTIS, PC A06/MF A01 - GPO. File Number TI85015267.

As part of its reevaluation of the double-ended guillotine break (DEGB) of reactor coolant loop piping as a design basis event for nuclear power plants, the US Nuclear Regulatory Commission (NRC) contracted with the Lawrence Livermore National Laboratory (LLNL) to estimate the probability of occurrence probability. This report describes a probabilistic evaluation of reactor coolant loop piping in PWR plants having nuclear steam supply systems designed by Westinghouse. Two causes of pipe break were considered: pipe fracture due to the growth of cracks at welded joints ("direct" DEGB), and pipe rupture indirectly caused by failure of component supports due to an earthquake ("indirect" DEGB). The probability of direct DEGB was estimated using a probabilistic fracture mechanics model. The probability of indirect DEGB was estimated by estimating support fragility and then convolving fragility and seismic hazard. The results of this study indicate that the probability of a DEGB from either cause is very low

for reactor coolant loop piping in these plants, and that NRC should therefore consider eliminating DEGB as a design basis event in favor of more realistic criteria. 17 refs., 15 figs., 11 tabs.

39355 **(NUREG/CR—4038) Sensitivity and uncertainty studies of the CRAC2 computer code.** Kocher, D.C.; Ward, R.C.; Killough, G.G.; Dunning, D.E. Jr.; Hicks, B.B.; Hosker, R.P. Jr.; Ku, J.Y.; Rao, K.S. (Oak Ridge National Lab., TN (USA)). May 1985. Contract AC05-84OR21400. 253p. (ORNL—6114). NTIS, PC E13/MF A01 - GPO. File Number TI85011554.

Includes 4 sheets of 48x reduction microfiche.

This report presents a study of the sensitivity of early fatalities, early injuries, latent cancer fatalities, and economic costs for hypothetical nuclear reactor accidents as predicted by the CRAC2 computer code (CRAC = Calculation of Reactor Accident Consequences) to uncertainties in selected models and parameters used in the code. The sources of uncertainty that were investigated in the CRAC2 sensitivity studies include (1) the model for plume rise, (2) the model for wet deposition, (3) the procedure for meteorological bin-sampling involving the selection of weather sequences that contain rain, (4) the dose conversion factors for inhalation as they are affected by uncertainties in the physical and chemical form of the released radionuclides, (5) the weathering half-time for external ground-surface exposure, and (6) the transfer coefficients for estimating exposures via terrestrial foodchain pathways. The sensitivity studies were performed for selected radionuclide releases, hourly meteorological data, land-use data, a fixed non-uniform population distribution, a single evacuation model, and various release heights and sensible heat rates. Two important general conclusions from the sensitivity and uncertainty studies are as follows: (1) The large effects on predicted early fatalities and early injuries that were observed in some of the sensitivity studies apparently are due in part to the presence of thresholds in the dose-response models. Thus, the observed sensitivities depend in part on the magnitude of the radionuclide releases. (2) Some of the effects on predicted early fatalities and early injuries that were observed in the sensitivity studies were comparable to effects that were due only to the selection of different sets of weather sequences in bin-sampling runs. 47 figs., 50 tabs.

39356 **(NUREG/CR—4137) Pretest predictions for the response of a 1:8-scale steel LWR containment building model to static overpressurization.** Clauss, D.B. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1985. Contract AC04-76DP00789. 51p. (SAND—85-0175). NTIS, PC A04/MF A01 - GPO. File Number TI85015569.

The analyses used to predict the behavior of a 1:8-scale model of a steel LWR containment building to static overpressurization are described and results are presented. Finite strain, large displacement, and nonlinear material properties were accounted for using finite element methods. Three-dimensional models were needed to analyze the penetrations, which included operable equipment hatches, personnel lock representations, and a constrained pipe. It was concluded that the scale model would fail due to leakage caused by large deformations of the equipment hatch sleeves. 13 refs., 34 figs., 1 tab.

39357 **(NUREG/CR—4138) Data analyses for Nevada Test Site (NTS) premixed combustion tests.** Ratzel, A.C. (Sandia National Labs., Albuquerque, NM (USA)). May 1985. Contract AC04-76DP00789. 174p. (SAND—85-0135). NTIS, PC A08/MF A01 - GPO. File Number TI85015258.

This report provides results from an in-depth analysis of twenty-one of the twenty-four premixed large-scale combustion experiments sponsored by the US Nuclear Regulatory Commission (NRC) and the Electric Power Research Institute (EPRI) and conducted by EG and G at the Nevada Test Site (NTS). These experiments were performed in a 2048 cubic meter spherical vessel (hydrogen dewar) with mixtures of hydrogen, steam, and air ignited by glow plugs or heated resistance coils. Hydrogen concentrations ranged from 5 to 13% (by volume) and steam concentrations from 4 to 40%. Several tests also incorporated spray systems and/or fans which enhanced the combustion rate and significantly altered the postcombustion gas cooling. In this work, data provided by EPRI from instrumentation designed to characterize the thermal environment in the dewar during and following combustion have been evaluated. The data reduction package SMOKE has been used to process data from thin-film gauges, Gardon and Schmidt-Boelter heat flux gauges, capacitance calorimeters, gas and wall thermocouples, and pressure sensors. Local measurements of the heat transfer are provided from the calorimetry, and global averages are inferred from the pressure. Instrumentation "goodness" for each test is assessed based on the raw data and on comparisons of local and global results. Graphical and tabular results are provided for each test, ad trends observed from the results are reported. This information should be useful for benchmarking existing computer codes used in modeling nuclear containment and associated safety-related equipment response to degraded-core accidents and for improving combustion and heat transfer models currently used in these computer simulations. 26 refs., 109 figs., 20 tabs.

39358 **(NUREG/CR—4213) SETS reference manual.** Worrell, R.B. (Sandia National Labs., Albuquerque, NM (USA)). May 1985. Contract AC04-76DP00789. 238p. (SAND—83-2675). NTIS, PC A11/MF A01 - GPO. File Number TI85016136.

The Set Equation Transformation System (SETS) is used to achieve the symbolic manipulation of Boolean equations. Symbolic manipulation involves changing equations from their original forms into more useful forms - particularly by applying Boolean identities. The SETS program is an interpreter which reads, interprets, and executes SETS user programs. The user writes a SETS user program specifying the processing to be achieved and submits it, along with the required data, for execution by SETS. Because of the general nature of SETS, i.e., the capability to manipulate Boolean equations regardless of their origin, the program has been used for many different kinds of analysis.

39359 **(NUREG/CR—4240-Vol.1) Physics of reactor safety. Quarterly report, January-March 1985. Volume 1.** (Argonne National Lab., IL (USA)). May 1985. Contract W-31-109-ENG-38. 25p. (ANL—85-23-Vol.1). NTIS, PC A02/MF A01 - GPO. File Number TI85014330.

The work in the Applied Physics Division includes reports on reactor safety modeling and assessment by members of the Reactor Safety Appraisals Section. This will be the final Quarterly Report on this activity as funding for it has now been exhausted. Work on reactor core thermal-hydraulics is performed in ANL's Components Technology Division, emphasizing 3-dimensional code development for LMFBR accidents under natural convection conditions.

39360 **(NUREG/CR—4248) Recommendations for NRC policy on shift scheduling and overtime at nuclear power plants.** Lewis, P.M. (Pacific Northwest Labs., Richland, WA (USA)). Jul 1985. Contract AC06-76RL01830. 151p. (PNL—5435). NTIS, PC A08/MF A01 - GPO. File Number TI85015538.

This report contains the Pacific Northwest Laboratory's (PNL's) recommendations to the US Nuclear Regulatory Commission (NRC) for an NRC policy on shift scheduling and hours of work (including overtime) for control room operators and other safety-related personnel in nuclear power plants. First, it is recommended that NRC make three additions to its present policy on overtime: (1) limit personnel to 112 hours of work in a 14-day period, 192 hours in 28 days, and 2260 hours in one year; exceeding these limits would require plant manager approval; (2) add a requirement that licensees obtain approval from NRC if plant personnel are expected to exceed 72 hours of work in a 7-day period, 132 hours in 14 days, 228 hours in 28 days, and 2300 hours in one year; and (3) make the policy a requirement, rather than a nonbinding recommendation. Second, it is recommended that licensees be required to obtain NRC approval to adopt a routine 12-hour/day shift schedule. Third, it is recommended that NRC add several nonbinding recommendations concerning routine 8-hour/day schedules. Finally, because additional data can strengthen the basis for future NRC policy on overtime, five methods are suggested for collecting data on overtime and its effects. 44 refs., 10 tabs.

39361 **(NUREG/CR—4290-Vol.2) Probability of pipe failure in the reactor coolant loops of Babcock and Wilcox PWR plants. Volume 2. Guillotine break indirectly induced by earthquakes.** Ravindra, M.K.; Campbell, R.D.; Kipp, T.R.; Sues, R.H. (NTS/Structural Mechanics Associates, Newport Beach, CA (USA)). Jul 1985. Contract W-7405-ENG-48. 145p. (UCRL—53644-Vol.2). NTIS, PC A07/MF A01 - GPO. File Number TI85015373.

The requirements to design nuclear power plants for the effects of an instantaneous double-ended guillotine break (DEGB) of the reactor coolant loop (RCL) piping have led to excessive design costs, interference with normal plant operation and maintenance, and unnecessary radiation exposure of plant maintenance personnel. This report describes an aspect of the NRC/Lawrence Livermore National Laboratory sponsored research program aimed at exploring whether the probability of DEGB in RCL Piping of nuclear power plants is acceptably small and the requirements to design for the DEGB effects (e.g., provision of pipe whip restraints) may be removed. This study estimates the probability of indirect DEGB in RCL piping as a consequence of seismic-induced structural failures within the containment of Babcock and Wilcox supplied pressurized water reactor nuclear power plants in the United States. The median probability of indirect DEGB was estimated to range between 6 x 10^{-11} and 1 x 10^{-7} per year. Using very conservative assumptions, the 90% subjective probability value (confidence) of P/sub DEGB/ was found to be less than 1 x 10^{-5} per year. 19 refs., 19 figs., 11 tabs.

39362 **(NUS—4382) Development of probabilistic risk assessment framework for utilization of data. TMI-2 technology transfer contract. Task 3 final report.** Orvis, D.D.; Frank, M.V.; Spurgin, A.J. (NUS Corp., Gaithersburg, MD (USA)). Jun 1983. Contract AC01-83NE32114. 159p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE85014744.

This study has adapted the techniques of probabilistic risk assessment (PRA) into a framework to help define areas where the results of TMI-2 planned of potential research could be used to reduce the risk of operating a nuclear power plant. In this study, effort was concentrated on ways to improve the ability of a power station to recover from events that have the potential to lead to accident sequences that could involve severe core damage or even core melt with subsequent vessel and containment failure. The underlying philosophy is that of risk reduction through reducing the probability that an accident sequence will progress to severe core damage. The study has demonstrate how probabilistic modeling of accident sequences, using event tree and fault tree logic models, can be applied to quantify the importance, during the course of an accident, of having available various instrument readings and operating fluid systems, and of various operator actions that could be taken. From such quantification, a priority ranking for gathering system and instrument information can be derived. Furthermore, such logic models coupled with a knowledge of the progression of physical processes such as time of core uncovery, release of radionuclides to the containment, onset of containment sprays, etc., can be used to specify which systems should be examined for survivability in adverse environments. The PRA framework could also be be applied to evaluate the efficacy of present and proposed emergency operating procedures. Finally, the information potentially available from TMI-2 can be used to improve PRA modeling of accident sequences and thereby benefit the industry. 53 refs., 21 figs., 22 tabs.

39363 **(ORNL—6138) Guidelines for ground motion definition for the eastern United States.** Gwaltney, R.C.; Aramayo, G.A.; Williams, R.T. (Oak Ridge National Lab., TN (USA)). Jun 1985. Contract AC05-84OR21400. 123p. NTIS, PC A06/MF A01; GPO Dep. File Number DE85015079.

Guidelines for the determination of earthquake ground motion definition for the eastern United States are established here. Both far-field and near-field guidelines are given. The guidelines were based on an extensive review of the current procedures for specifying ground motion in the United States. Both empirical and theoretical procedures were used in establishing the guidelines because of the low seismicity in the eastern United States. Only a few large- to great-sized earthquakes (M/sub s/ > 7.5) have occurred in this region, no evidence of tectonic surface ruptures related to historic or Holocene earthquakes has been found, and no currently active plate boundaries of any kind are known in this region. Very little instrumented data have been gathered in the East. Theoretical procedures are proposed so that in regions of almost no data, a reasonable level of seismic ground motion activity can be assumed. The guidelines are to be used to develop the safe shutdown earthquake (SSE). A new procedure for establishing the operating basis earthquake (OBE) is proposed, in particular for the eastern United States. The OBE would be developed using a probabilistic assessment of the geological conditions and the recurrence of seismic events at a site. These guidelines should be useful in development of seismic design requirements for future reactors. 17 refs., figs., tabs.

39364 **(PB—85-186641/XAB) Transition from slow deflagration to detonation. Final report.** Koch, C.; Drenckhahn, W. (Commission of the European Communities, Luxembourg). [1985]. 63p. (EUR—9354-EN). NTIS, PC E04/MF E04.

The report reviews external vapor-cloud explosion phenomena, especially transition from deflagration to detonation, in the context of nuclear power plant safety, for explosions postulated according to the B.M.T. guideline Chemical Explosions. Damage analyses of recorded accidents show that fast deflagration, not detonation, explains their consequences. Subsequently, laboratory- and large-scale trials are surveyed and safety-related conclusions drawn. Large unconfined cloud field trials (Maplin Sands, China Lake), for propane/butane, evidence negligible overpressures (a few millibar). Balloon tests, for stoichiometric hydrogen-air mixture, up to 2000 cu m, yielded about 60 millibar max. Flame acceleration due to obstacles, nets, turbulence-inducing structures was investigated. Small- to large-scale trials, with hydrogen-air mixtures, show that transition to detonation is restricted to jet ignition. Main safety-related conclusions are: detonation need not be postulated. Even a partially-confined stoichiometric hydrogen-air cloud generates less than 0.3 bar; jet ignition should be avoided by appropriate design; turbulence-inducing obstacles: gratings, pipes, corners merely produce local overpressures and cannot cause transition to detonation.

39365 **(PNL-SA—12186) Measurements of neutron dose and spectra inside reactor containment.** Endres, G.W.R.; Brackenbush, L.W.; Cummings, F.M.; Faust, L.G. (Pacific Northwest Labs., Richland, WA (USA)). Mar 1984. Contract AC06-76RL01830. 14p. (CONF-840901—25). NTIS (US Sales Only), PC A02/MF A01; GPO Dep. File Number DE85013497.

From ANS topical meeting on reactor physics and shielding; Chicago, IL, USA (17 Sep 1984).

The Pacific Northwest Laboratory operated by Battelle for the Department of Energy (DOE) had developed several instruments for measuring neutron dose and energy spectra for DOE while the Nuclear Regulatory Commission has funded measurements of absorbed neutron dose rates, dose equivalent rates and energy spectra of areas inside commercial nuclear reactors. These measurements were made to characterize radiation fields and improve neutron dosimetry for personnel who enter containment while the reactor is operating. Measurements were made at many different locations inside the containment of Pressurized Water Reactors and inside the drywell of Boiling Water Reactors during start-up in neutron fields that varied from less than 1 mrem/hr to more than 20 rem/hr. Absorbed dose and dose equivalent measurements were made with several different types of instruments. The tissue equivalent proportional counter (TEPC) was used to make absolute absorbed neutron dose measurements in tissue. Absorbed dose and dose equivalent were also calculated from the neutron flux and energy spectra measured by the multisphere (or Bonner sphere) spectrometer. There was generally good agreement (20 percent on the average) between the dose equivalent determined from multisphere spectrometer and tissue equivalent proportional counter measurements. The neutron energy spectrum measurements show that in general the flux weighted average neutron energies are between 1 keV and 100 keV in PWRs; in BWRs the average energy is higher and is usually above 100 keV. 18 refs., 4 figs., 2 tabs.

39366 (SAND—84-1427C) Comparison of analytical and experimental results from pressurization of a 1:8-scale steel containment model. Clauss, D.B.; Horschel, D.S. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 26p. (CONF-850809—5). NTIS, PC A03/MF A01. File Number TI85006763.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

Analytical predictions for the response of a 1:8-scale model of a steel nuclear containment building subjected to pressure levels exceeding the design basis are compared to experimental results. Analyses were performed prior to the test using the MARC finite element code. An evaluation of the predictive capabilities is made in light of the comparisons made with test data. A criterion for evaluating the leakage potential of pressure-seating seals for equipment hatches is proposed. 10 refs., 15 figs.

39367 (UCRL—92125) Use of reliability data for QA program evaluation. Guarro, S.B. (Lawrence Livermore National Lab., CA (USA)). 1985. Contract W-7405-ENG-48. 12p. (CONF-850809—26). NTIS, PC A02/MF A01; GPO Dep. File Number DE85008295.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

Possible analytical approaches for evaluation of the effectiveness in the operation of US commercial nuclear power plants are discussed. These approaches may be based on key plant component performance comparisons, correlation models, or comprehensive cost-benefit evaluation frameworks. As plant availability and reliability data must be used to quantify the models, the quality of these data conditions the amount of information that can ultimately be extracted. The potential impact of uncertainties in the data must be considered carefully, especially before application of the more complex models. 10 refs., 4 tabs.

39368 (UNI-SA—147) Shippingport Atomic Power Station decommissioning transfer planning. Pasquini, L.A. (UNC Nuclear Industries, Inc., Richland, WA (USA)). 15 Jul 1985. Contract AC06-76RL01857. 8p. (CONF-850720—1). NTIS, PC A02/MF A01 - GPO. File Number TI85015098.

From International nuclear reactor decommissioning planning conference; Bethesda, MD, USA (16 Jul 1985).

The Shippingport Station Decommissioning Project (SSDP) is the first commercial size nuclear power plant to undergo decommissioning in the United States. One of the objectives in decommissioning the plant is to demonstrate the technology used and thoroughly document the results for dissemination to utilities, government entities, the nuclear industry, and the decommissioning community. DOE has established a Technology Transfer Program to assure that useful information compiled on the project, such as management techniques, radiological controls, decommissioning methods, lessons learned and other special studies and tests, expected to be of interest to the industry, is adequately documented and available to outside parties or participants. The Shippingport decommissioning experience will create a significant data base for the nuclear utility industry in future decommissioning of commercial nuclear power generating facilities.

39369 (UNI-SA—149) Shippingport Station Decommissioning Project: overview. Mickelson, J.R.; Schreiber, J.J. (UNC Nuclear Industries, Inc., Richland, WA (USA)). 15 Jul 1985. Contract AC06-76RL01857. 11p. (CONF-850720—2). NTIS, PC A02/MF A01 - GPO. File Number TI85015099.

From International nuclear reactor decommissioning planning conference; Bethesda, MD, USA (16 Jul 1985).

Shippingport was shut down in October 1982. Defueling operations were complete September 1984. The decommissioning project consists of 2 phases and will be completed in April 1990. This overview discusses the schedule, technical statistics, organization, operations, scope of activity specifications, final site configuration, radiological condition, and cost summary. (DLC)

39370 (UNI-SA—151) Decommissioning planning and the assessment of alternatives for the Hanford production reactors. Miller, C.E. Jr.; Potter, R.F. (United Nuclear Industries, Inc., Richland, WA (USA)). 2 Jul 1985. Contract AC06-76RL01857. 16p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015169.

Several years ago, the US Department of Energy began assessing alternatives and planning the decommissioning of eight shutdown plutonium production reactors located on the DOE Hanford Site in Washington State. The first of these graphite-moderated, water-cooled, reactors was built and started up in 1944 as part of the World War II Manhattan Project. The last of them started up in 1955. The eight reactors each operated for 12 to 24 years, with all eight operating simultaneously for about 10 years. In the 1960's, production needs declined and the reactors were one-by-one permanently shut down, the last of them in 1971. (A ninth Hanford production reactor, N Reactor, was started up in 1963; it is still operating and is not within the scope of the decommissioning planning and alternatives assessment work reported in this paper). This paper provides an overview description of the decommissioning plan for the eight shut-down Hanford production reactors and their associated fuel storage basins. Included are descriptions of the decommissioning alternatives considered for the facilities, along with discussions of National Environmental Policy Act (NEPA) process activities applicable to the Hanford decommissioning work. The criteria used in assessing decommissioning alternatives and the assumptions used in the decommissioning planning are identified. 4 refs., 8 figs., 3 tabs.

39371 Recent research on methodology for seismic qualification of nuclear power plant equipment. Kana, D.D.; Pomerening, D.J.; Simonis, J.C. (Southwest Research Inst., San Antonio, TX (USA). Engineering and Material Sciences Div.). *Nuclear Engineering and Design;* **79**: No. 2, 229-241(May 1984). (CONF-830805—).

From 7. international conference on structural mechanics in reactor technology; Chicago, IL, USA (22 Aug 1983).

A brief review of methodology and a description of some related recent research are given for seismic qualification of equipment. Some of the developments allow a better satisfaction of current requirements and a reduction in unnecessary conservatism. Examples include the use of response spectrum to power transformations and various parameters for synthesizing more suitable test waveforms. Other developments allow a comparison of earlier simple test procedures with recent more complex criteria by means of a vibration equivalence concept based on fragility.

25 ENERGY STORAGE

2503 Pumped Hydro

REFER ALSO TO CITATION(S) 39097

2506 Thermal

REFER ALSO TO CITATION(S) 39439

2509 Batteries

39372 (EPRI-EM—4151) Degradation of beta″ alumina electrolytes. Final report. De Jonghe, L.C. (Lawrence Berkeley Lab., CA (USA)). Jul 1985. Contract AC03-76SF00098. 117p. NTIS, PC A06/MF A01; 1 - Research Reports Center, Box 50490, Palo Alto, CA 94303; GPO Dep. File Number DE85015300.

Increasing electrolyte reliability during cell operation is a major challenge facing developers of beta batteries. Laboratory experiments have shown that subcritical crack growth in beta″ alumina electrolytes decreases cell durability. However, adding zirconia to beta″ alumina increases its toughness and eliminates exaggerated grain growth that may lead to early cell failures.

39373 **(PB—85-186658/XAB) Study by optical and scanning electron microscopy of mercury used by amalgamate zinc powders in alkaline cell production.** Taghavi, S. (Centre d'Etude de l'Energie Nucleaire, Mol (Belgium)). Jan 1985. 86p. (In French). (BLG—574). NTIS, PC E06/MF E06.

With the view of meeting the pollution and cost problems associated with the massive use of mercury in alkaline cell production, the fate of mercury used to amalgamate zinc powders, superficially or in volume, is studied by optical and scanning electron microscopy, electronic microprobe, microhardness measurement and X-ray diffraction. Examination of entire particles and particle sections shows that the inward diffusion of superficially deposited mercury, remains confined to the immediate vicinity of grain boundaries. The overall mercury penetration remains sufficiently small to keep the basic advantages of superficial over homogeneous amalgamation procedures. These advantages are however reduced, in presently used techniques, by undesirable effects, which are put in evidence and discussed.

29 ENERGY PLANNING AND POLICY

39374 **(NP—5770326) Japan - energy situation 1983.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Mar 1985. 62p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE85770326.

The energy situation of Japan is reviewed on the basis of relevant data. Some remarks on the country's national energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade. Energy forecasts are presented up to 1995. There is an appendix containing detailed statistics.

39375 **(NP—5770327) Netherlands - energy situation 1983/1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Mar 1985. 26p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE85770327.

The energy situation of the Netherlands is reviewed on the basis of relevant data. Some remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade and the balance of payments.

2901 Energy Analysis And Modeling

REFER ALSO TO CITATION(S) 39402

39376 **(DOE/CE/40561—T1) Energy efficiency in American industry: leveraging a national effort for increasing industrial conservation technology. Final report.** Lisee, E.J.; Willman, A.J. (ACEC Research and Management Foundation, Washington, DC (USA)). Jul 1985. Contract FG01-84CE40561. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014939.

Results of an industrial energy management project undertaken by the ACEC Research and Management Foundation (ACEC/RMF) are described. A series of reference resources as developed and executed include: Three Industrial Market and Energy Management Guides (food and kindred products, textile mill products, and rubber and miscellaneous plastic products); case studies of new technology application in industry; technical resource center and annotated bibliography; and two industrial energy management seminar programs for more than 100 professionals.

39377 **(UCID—19227-84) US energy flow - 1984.** Briggs, C.K.; Borg, I.Y. (Lawrence Livermore National Lab., CA (USA)). 1 Jul 1985. Contract W-7405-ENG-48. 17p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015419.

The 1984 energy flow diagram for the USA has been constructed using Department of Energy data. It is a convenient graphical device to show supply and demand as well as the size of end-use sectors. A 4% increase in overall energy consumption represented a reversal in a downward trend started in 1979. All indicators pointed to more healthy industrial and farm economies in 1984 than in the previous two years, which accounted for some part of the increase in energy use. While domestic crude oil production remained stable, oil imports rose eight percent also reversing a long-standing trend. Seventy-two million barrels of oil primarily from Mexico and the United Kingdom were added to the Strategic Petroleum Reserve bringing the total oil stored at year end to 451 million barrels. At the same time 49 million barrels of oil were produced from the government-owned Naval Petroleum Reserve No. 1 (Elk Hills, CA). Energy use in all end-use sectors grew in 1984 which is in keeping with increases in use of all types of fossil fuels as well as electricity. Increase in electrical power demand continued to exceed forecasts, and during 1984 contracts for imports to the northeast US were negotiated with Canada. Nuclear power contributed 15% of total power generated in the US. At year end there were 86 licensed reactors and 44 in either start-up or construction stages. Six were canceled or abandoned during construction during the year. 11 refs., 4 figs., 3 tabs.

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 38802, 38876, 39411, 39412, 39413, 40201

39378 **(CONF-8506163—1) Unbalanced recovery in energy related markets: growth retarding implications for 1985.** Santini, D.J. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 22p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014971.

From 5. international symposium on forecasting; Montreal, Canada (9 Jun 1985).

The paper explains the prediction that energy-intensive sectors of the economy (automobile and oil companies) will retard economic growth in 1985 to such a degree that recession is likely. The nature of the causes of this atypical growth slowdown are compared to the author's theory of normal causes of recessions and depressions. The predicted energy sector problems are related to the theory that a potentially depression-inducing several year transition among energy-producing and energy-consuming technologies was initiated after the 1978-1979 oil price shock. The problems of 1985 result from the inherent difficulty of achieving equilibrium in these energy-producing and consuming markets during the several year technological transition by producers. The recovery of 1981 is attributed to a boom in oil industry investment which may prove in 1985 to have been wasteful investment. Stagnation in the production of domestic automobiles, in combination with retrenchment in the oil and steel industries, is suggested to potentially be drastic enough to cause a recession, given the weakness of other sectors of the economy. While monetary ease is a correct response to the energy-related problems of 1985, its effect may be dampened by expanded consumption of imports. 31 refs., 3 tabs.

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 39239, 40121, 40131, 40147, 40148, 40149, 40150, 40151, 40158, 40159, 40174, 40200, 40265, 40317

39379 (INIS-mf—9602, pp 157-168) **Optimal allocation of resources for safety.** Niehaus, F.; Novegno, A. (International Atomic Energy Agency, Vienna (Austria)). Apr 1983. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781244. (CONF-8210330—).

From Symposium on assessment and perception of risk to human health in Canada; Toronto, Ontario, Canada (18 Oct 1982).

Safety expenditures generally follow a law of diminishing returns. Risks usually cannot be reduced to zero, and the marginal costs of risk reduction increase (often exponentially) with the level of safety achieved. Therefore, the answer to the question how safe is safe enough is determined by a compromise between the two objectives of using limited resources most effectively (minimizing cost) and of achieving the highest level of safety (minimizing risk). This paper suggests that a practical limit to risk reduction does exist, since excessive expenditures for risk reduction will actually increase the total risk to society. Based on input-output methodology it was found that for high marginal cost of risk reduction (> 30 million $/life saved) the risk of producing safety equipment will be

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greater than the effects prevented. Comparative cost-effectiveness analysis (marginal cost-benefit analysis) provides suitable decision rules for safety policy with the objective of optimal allocation of safety resources.

39380 **(PB—85-186054/XAB) State participation in the Superfund remedial program, April 1985. Includes Addenda 1-6.** (Environmental Protection Agency, Washington, DC (USA). Office of Emergency and Remedial Response). Apr 1984. 504p. NTIS, PC A22/MF A01.

Supersedes PB84-208784.

This document provides information on how to implement approved remedial response activities at National Priorities List sites in accordance with the National Oil and Hazardous Substances Contingency Plan. Its scope includes cooperative agreements, Superfund State Contracts and credit claims. Further, this document incorporates several new Superfund initiatives EPA has taken in the past year to facilitate remedial response and to make it easier for States to join EPA in addressing problems at uncontrolled hazardous waste sites. The document is intended to serve as a manual for State and EPA staff who are implementing the Superfund remedial program, consistent with the delegations of authority the authors plan to issue in the coming months. Until these delegations are approved, cooperative agreements, Superfund State Contracts and audit responses will be processed in Headquarters in accordance with current practice.

2904 Natural Resources

REFER ALSO TO CITATION(S) 40352

39381 **(DOE/BP—468) Pacific Northwest Rivers Study assessment guidelines: Montana.** (Montana Dept. of Fish, Wildlife and Parks, Helena (USA)). Jun 1985. 90p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85014184.

This document presents the process that the state, Federal agencies, and Indian tribes will follow to complete the Pacific Northwest Rivers Study. It identifies assessment guidelines for each river resource category, provides reporting formats for data collection and presentation, and describes expected results and applications. The purpose of the project is to identify resource considerations which might have a bearing on hydropower development. The objective is to use this information to identify areas where minimal impact can be anticipated and thus where development might be appropriate.

39382 **(DOE/BP—469) Pacific Northwest Rivers Study assessment guidelines: Idaho.** (Idaho Dept. of Fish and Game, Boise (USA). Program Coordination Bureau). Jun 1985. 86p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85014183.

This document presents the process that the state, Federal agencies, and Indian tribes will follow to complete the Pacific Northwest Rivers Study. It identifies assessment guidelines for each river resource category, provides reporting formats for data collection and presentation, and describes expected results and applications. The purpose of the project is to identify resource considerations which might have a bearing on hydropower development. The objective is to use this information to identify areas where minimal impact can be anticipated and thus where development might be appropriate.

39383 **(DOE/BP—470) Pacific Northwest Rivers Study assessment guidelines: Oregon.** (Oregon State Dept. of Energy, Salem (USA)). Jun 1985. 84p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85014186.

This document presents the process that the state, Federal agencies, and Indian tribes will follow to complete the Pacific Northwest Rivers Study. It identifies assessment guidelines for each river resource category, provides reporting formats for data collection and presentation, and describes expected results and applications. The purpose of the project is to identify resource considerations which might have a bearing on hydropower development. The objective is to use this information to identify areas where minimal impact can be anticipated and thus where development might be appropriate.

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39384 **(DOE/BP—471) Pacific Northwest Rivers Study assessment guidelines: Washington.** (Washington State Energy Office, Olympia (USA)). Jun 1985. 73p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85014185.

This document presents the process that the state, Federal agencies, and Indian tribes will follow to complete the Pacific Northwest Rivers Study. It identifies assessment guidelines for each river resource category, provides reporting formats for data collection and presentation, and describes expected results and applications. The purpose of the project is to identify resource considerations which might have a bearing on hydropower development. The objective is to use this information to identify areas where minimal impact can be anticipated and thus where development might be appropriate.

39385 **(USGS/WRI—84-4065) Availability and chemistry of ground water on the Bruneau Plateau and adjacent eastern plain in Twin Falls County, south-central Idaho.** Moffatt, R.L.; Jones, M.L. (Geological Survey, Boise, ID (USA). Water Resources Div.). 1984. 65p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901798.

Includes geological map.

The Bruneau plateau in south-central Idaho consists of about 889,600 acres of irrigable land. About 112,200 acres have been developed for agriculture; 11,200 acres are irrigated with ground water, and 101,000 acres are irrigated with available surface water from the Snake and Bruneau Rivers and Salmon Falls Creek. On the basis of present usage, about 158,000 acre-feet per year of water are needed to develop an additional 63,000 acres. About 438,000 acre-feet per year are needed to irrigate existing and newly developed lands in dry years when streamflow in the Snake River at Milner Dam is inadequate to meet appropriated needs. Pumping lifts of about 400-600 feet and low well yields on the Bruneau plateau preclude large-scale irrigation development solely from the local ground-water resources. Supplemental sources of irrigation water beneath the plain adjacent to the Bruneau plateau include a perched-water aquifer, a thermal aquifer that underlies a large part of southwestern Idaho, and a regional aquifer. An estimated 100,000-115,000 acre-feet per year of water from the perched and regional aquifers could be withdrawn. The amount of water that could be safely withdrawn from the thermal aquifer was not determined. Water samples from a few wells contained concentrations of dissolved solids, pH, fluoride, chloride, or sulfate that exceeded either required or recommended drinking water limits. In general, however, most ground water in the area is suitable for domestic and stock use. High salinity in water from perched and regional aquifers beneath the Twin Falls South-Side Tract probably precludes using it to irrigate salt-sensitive crops. 32 refs., 13 figs., 7 tabs.

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 38727, 38995, 39770, 40159, 40355

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 39143, 39170, 39256, 39360

39386 **(F—82007) Status report on potential future nuclear energy cycles in the period 1982-2020.** (Canadian Fusion Fuels Technology Project, Toronto, Ontario; Monserco Ltd., Mississauga, Ontario (Canada)). Nov 1982. 69p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701680.

The demand for electrical power and the availability of fuel to supply it is the driving force behind any change in the electrical supply technology. A survey of a number of recent world wide electrical power growth projections indicates a growth rate of between 2 percent and 4 percent within the period of 1980 to 2020. In some countries, such as France and Japan, without large domestic supplies of conventional fuels, there is a significant effort to extend supplies of uranium using advanced fuel cycles and breeder reac-

tors. In North America, and in particular the United States, there would appear to be adequate supplies of conventional fuel for the projected growth for the period of the study. Development of advanced fuel cycles in this case will be driven by economic considerations rather than strategic ones. A review of the current status of fusion test facilities is included in the report, but the consensus of opinion of the literature surveyed would indicate that no commercial scale generating plant will be operational within the study period.

39387 **(INIS-mf—9513) IAEA and non-proliferation: is quiescence progress.** Herron, L.W. (International Nuclear Law Association (INLA), Brussels (Belgium)). 1983. 13p. (CONF-8309278—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781401.

From Nuclear inter jura '83; San Francisco, CA, USA (11 Sep 1983).

The purpose of this paper is to evaluate the current status of more important non-proliferation aspects affecting or involving the IAEA. The questions dealt with cover in particular the Non-Proliferation Treaty, the Tlatelolco Treaty, the Committee on Assurances of Supply established by the IAEA in 1980 and the International Plutonium Storage Study prepared by an IAEA expert group. The author concludes that in a number of areas involving this Agency, recent considerable activity at both political and technical levels has produced few tangible results although the situation is not static.

39388 **(INIS-mf—9514) Non-proliferation and nuclear co-operation - accomplishments and challenges.** Marshall, H.R. Jr. (International Nuclear Law Association (INLA), Brussels (Belgium)). 1983. 16p. (CONF-8309278—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781402.

From Nuclear inter jura '83; San Francisco, CA, USA (11 Sep 1983).

The purpose of this paper is to assess the accomplishments in non-proliferation and nuclear co-operation since the beginning of President Reagan's administration, and the challenges remaining to be met in those fields.

39389 **(INIS-mf—9515) Current assessment and future potential of the international nuclear market.** Cassidy, P.R. (International Nuclear Law Association (INLA), Brussels (Belgium)). 1983. 13p. (CONF-8309278—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781356.

From Nuclear inter jura '83; San Francisco, CA, USA (11 Sep 1983).

This is a study of the current and future situation of the international nuclear market. This paper highlights the projections as seen not only by Bechtel Power Corporation, but also by the international nuclear community. It covers in particular the electric power growth projection; the percentage of probable nuclear power generation; operating services for existing nuclear power plants; and the nuclear fuel cycle.

39390 **(INIS-mf—9516) Legal aspects of nuclear technology transfer in connection with Latin America.** Zaldivar, E. (International Nuclear Law Association (INLA), Brussels (Belgium)). 1983. 17p. (CONF-8309278—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781357.

From Nuclear inter jura '83; San Francisco, CA, USA (11 Sep 1983).

This paper concerns technology and technology transfers which are becoming increasingly important for developing countries, especially those in South America. The author also points out that developed countries have not implemented the United Nations resolutions concerning dissemination of knowledge on advanced technologies. He stresses that if South American States wish to obtain assistance with nuclear technology from developed countries they should sign and ratify the Non-Proliferation Treaty and the Tlatelolco Treaty.

39391 **(INIS-mf—9518) Control of non-proliferation of nuclear weapons and nuclear development - present uncertainties.** Machado de Faria, N.G.; Amaral Barros, E. (International Nuclear Law Association (INLA), Brussels (Belgium)). 1983. 10p. (CONF-8309278—9). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781403.

From Nuclear inter jura '83; San Francisco, CA, USA (11 Sep 1983).

This report gives the views of Brazilian lawyers on the non-proliferation of nuclear weapons. It deals with the present situation and future prospects concerning the uses of nuclear energy. In particular, it proposes the preparation of a protocol prohibiting the use of nuclear weapons.

39392 **(INIS-mf—9528) Nuclear power and the non-proliferation issue.** (British Nuclear Forum, London). Dec 1978. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781404.

This leaflet, issued by the British Nuclear Forum on behalf of the industry, seeks first to place the problem of reconciling the need for nuclear power with its possible weapon uses in a historical perspective. Secondly, it describes the technical and political measures which are now taken, and others which could be introduced in order to ensure that nuclear power, which offers the cheapest and safest large-scale energy source for the future, can be made available without contributing to the proliferation of nuclear weapons. Headings are: introduction; the early years; the IAEA; uranium enrichment; plutonium; secrecy has failed; the Non-Proliferation Treaty; the London Suppliers Group; the situation today; the British position; conclusions.

39393 **(INIS-mf—9529) Need for nuclear power.** (British Nuclear Forum, London). Dec 1977. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781353.

This leaflet examines our energy future and concludes that nuclear power is an essential part of it. The leaflet also discusses relative costs, but it does not deal with social and environmental implications of nuclear power in any detail, since these are covered by other British Nuclear Forum publications. Headings are: present consumption; how will this change in future; primary energy resources (fossil fuels; renewable resources; nuclear); energy savings; availability of fossil fuels; availability of renewable energy resources; the contribution of thermal nuclear power; electricity; costs for nuclear power.

39394 (INIS-mf—9532, pp 193-196) **Promise of tritium-lean fusion breeders.** Greenspan, E.; Miley, G.H. (Illinois Univ., Urbana (USA). Nuclear Engineering Lab.). 1983. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780892. (CONF-831241—Summ.).

From Joint US/Israeli meeting on safety and siting problems for power reactors in a small country; Haifa, Israel (20 Dec 1983).

Published in summary form only.

39395 (INIS-mf—9532, pp 1-4) **Nuclear education and the nuclear power program in Israel.** Notea, A. (Technion-Israel Inst. of Tech., Haifa. Dept. of Nuclear Engineering). 1983. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780892. (CONF-831241—Summ.).

From Joint US/Israeli meeting on safety and siting problems for power reactors in a small country; Haifa, Israel (20 Dec 1983).

Published in summary form only.

39396 (INIS-mf—9577, pp 1-3) **Chairman's address.** Campbell, P.G. (Ontario Hydro, Toronto (Canada)). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85780811. (CONF-8206271—Vol.1-Summs.).

From 22. annual international conference of the Canadian Nuclear Association; Toronto, Ontario, Canada (6 Jun 1982).

Published in summary form.

39397 (INIS-mf—9644, pp 121-125) **Federal government uranium and nuclear industry policies.** Hollbach, A.R. (Department of Energy, Mines and Resources, Ottawa, Ontario (Canada)). 1983. NTIS (US Sales Only), PC A08/MF A01. File Number DE85781436. (CONF-8211206—).

From Seminar on uranium and nuclear issues; Toronto, Ontario, Canada (2 Nov 1982).

This paper reviews problems in the uranium and nuclear industries as perceived by the Canadian government. The two major issues facing the Canadian uranium industry are the unstable market and the proposed legislation restricting imports into the United States. In both situations the author sees some hope. The nuclear industry review carried out in the early 1980s saw few prospects until the mid to late 1980s. An economic turnaround would have a profound effect on electricity demand and the need for new nuclear plants.

39398 **(INIS-mf—9644) Uranium and nuclear issues. Proceedings of a seminar.** (Canadian Nuclear Association, Toronto, Ontario). 1983. 159p. (CONF-8211206—). NTIS (US Sales Only), PC A08/MF A01. File Number DE85781436.

From Seminar on uranium and nuclear issues; Toronto, Ontario, Canada (2 Nov 1982).

This seminar focussed on the major issues affecting the future of the entire nuclear fuel cycle. In particular it covered issues bearing on the formation of public policy in relation to the use of uranium as an energy source: economic risk, industrial risks, health effects, site selection, environmental issues, and public acceptance.

39399 **(INIS-mf—9720) Code of Practice on Radiation Protection in the Mining and Processing of Mineral Sands (1982) (Western Australia).** (International Atomic Energy Agency, Vienna (Austria)). 1982. 18p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781502.

This Code establishes radiation safety practices for the mineral sands industry in Western Australia. The Code prescribes, not only for operators and managers of mines and processing plants but for their employees as well, certain duties designed to ensure that radiation exposure is kept as low as reasonably practicable. The Code further provides for the management of wastes, again with a view to keeping contaminant concentrations and dose rates within specified levels. Finally, provision is made for the rehabilitation of those sites in which mining or processing operations have ceased by restoring the areas to designated average radiation levels. (NEA).

39400 **(CE-Trans—7524) What about nuclear energy. Questions and answers about the peaceful uses of nuclear energy.** Butz, H.P.; Danzmann, H.J. (Central Electricity Generating Board, London (UK). Translations Section; Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). Oct 1982. Translation of GRS-S-25, February 1979. 79p. NTIS (US Sales Only), PC A05. File Number DE85901856.

A series of questions frequently asked about nuclear energy are presented with answers provided by the Reactor Safety Association. Questions address the function, environmental aspects, safety, licensing, and economics of nuclear power stations. Other questions address the disposal of radioactive wastes from nuclear power stations, fast breeder safety and plutonium problems. (DMC)

2908 Waste Heat Utilization

REFER ALSO TO CITATION(S) 39457

39401 **(OA-tr—2728) Use of heat pumps in district heat supply.** Winkens, H.P. Translated from *Fernwaerme International ;* **13**: No. 2, 73-78(Mar 1984). 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85901486.

The cost elements of heat pump heat supply stations are examined and the optimum relationship between peak load boiler and heat pump output is shown. The dependence of plant size and temperature on heat generating costs is indicated and the costs of heat distribution and heat transfer are analyzed. The possibility of a combined system of chp and heat pumps for the transport of heat over larger distances is shown. 8 refs., 13 figs.

2910 Conservation

REFER ALSO TO CITATION(S) 39415, 39453

2920 Supply, Demand, And Forecasting

REFER ALSO TO CITATION(S) 38794, 39377, 39386

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 39143, 39397, 39437, 40265

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 38784, 38784, 38794, 38795, 38796, 38796, 38799, 38802

39402 **(DOE/EI/19656—2) Oil Market Simulation model: model documentation report (Task 13). Final report.** (System Sciences, Inc., Bethesda, MD (USA)). 10 May 1985. Contract AC01-83EI19656. 157p. NTIS, PC A08/MF A01; 1 - GPO; GPO Dep. File Number DE85016246.

This report documents the Oil Market Simulation (OMS) model as used by the Energy Information Administration (EIA) to provide forecasts of world oil prices. In addition, the OMS model is used to examine the market responses to changes in oil demand and supply. The current version of the model provides additional OMS simulation capabilities to its predecessor. It performs not only the price and production simulations as before, but also simulations that converge to a user-specified regional demand, supply, or import level. Free world countries are grouped into seven major oil demand regions and eight major oil supply regions. The OMS model consists of three parts: oil demand, non-OPEC oil supply, and OPEC pricing behavior. Regional oil demand in a given year is determined as a function of the average world oil price for the year, the regional level of economic activity for the year, and the oil demand in the previous year. Non-OPEC regional oil supply is specified as a function of world oil price and the regional oil supply in the previous period. OPEC pricing behavior is related to the OPEC capacity utilization rate; OPEC sets the oil price based on the percent utilization of its availabile production capacity and the world oil price in the previous time period. Besides the behavior rules of consumers, non-OPEC producers, and OPEC producers, the OMS model includes some regional demand and supply values that are determined exogenously. These user-determined demand and supply values include: (1) OPEC demand, (2) US Strategic Petroleum reserve fill rates, and (3) the net exports from Centrally Planned Economies. 19 refs., 7 figs., 10 tabs.

2950 Hydrogen And Synthetic Fuels

39403 **(N—85-20143) Synthetic fuels policy.** (Committee on Energy and Commerce (U.S. House), Washington, DC). 1984. 472p. (GPO—34-227). Subcommittee on Fossil and Synthetic; Fuels.

The Energy Security Act was re-examined with special focus on synthetic fuel development. The present trend in oil prices is toward stability, energy consumption is being reduced, and energy efficiency gains are increasing. Long-term predictions and goals were also discussed.

2960 Electric Power

REFER ALSO TO CITATION(S) 38770, 39103, 39389, 40131, 40201

39404 **(ANL/EES-TM—37) Recommended methods for analysis of competition among new and existing technologies for the electrical generation market. Integrated assessments and policy evaluations.** (Argonne National Lab., IL (USA)). Feb 1978. Contract W-31-109-ENG-38. 105p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE85014319.

A comprehensive model of regional market competition among new and existing technologies for generating electricity is needed as a basis for programmatic recommendations on allocation of research, development, and demonstration (RD & D) funds among candidate technologies. An important adjunct to such a model would be a decision model that could provide quantitative measures of the relative social value of such technologies on nonmonetary criteria, such as health and environmental effects and sociopolitical and socioeconomic outcomes. These additional criteria could be quantified by the use of multi-attribute utility theory. The authors outline the requirements for a new, sophisticated model (MAP, the market analysis program) that would meet the objectives desired for the comprehensive model in permitting analysis of multi-utility regions such as reliability council areas. They recommend that either the MAP be developed or that the SLICK model of MITRE Corporation be modified extensively along the lines they discuss (which would yield a model less powerful than the proposed MAP, but still superior to any now existing); and that further exploration be carried out on development of a social-value model, to be used as a complement to either the MAP or the modified MITRE technique, as a potential source of additional levels of information for recommendation of RD & D allocations.

39405 **(DOE/EIA—0226(85/04)) Electric Power Monthly, April 1985.** (USDOE Energy Information Administration, Washington, DC. Office of Coal, Nuclear, Electric and Alternate Fuels). Jul 1985. 44p. NTIS, PC A03/MF A01; 1 - GPO; GPO Dep. File Number DE85014944.

The purpose of this publication is to provide timely information on US electric utilities' net generation, fuel consumption, fuel stocks, capacity of new plants, fuel receipts, fuel costs, electricity sales, and retail prices of electricity.

39406 **(DOE/IE/10372—T1) Electricity pricing and the financial health of electric utilities in the United States. Final report.** (ICF, Inc., Washington, DC (USA)). Aug 1984. Contract FG01-84IE10372. 71p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85014875.

The electric utility industry in the United States is characterized by wide diversity in utility ownership, management, cost structure, and regulation. There are approxiately 240 investor-owned utilities in the US. There are more than 1900 government utilities in the US. There are more than 50 regulatory commissions which regulate retail prices to ultimate customers. This substantial diversity in regulatory policies, processes, and rules applied to utilities across the country as well as significant regional variations in costs results in a wide variation in electricity prices and financial health among utilities. Prices and financial conditions for the industry as a whole also have varied substantially over time. During the 1960s, utilities were financially healthy, and real electricity prices were falling. In the decade following the Arab oil embargo in 1973, however, the industry was characterized by poor financial health and rapidly rising prices, although the reasons for these conditions varied somewhat between the first part of the decade and the last few years (1980-82) of the decade. Improved economic conditions during 1983 have contributed to improved utility financial health. A continuation of these economic conditions would result in continued financial stability for most utilties. Some individual utilities - particularly those with large constuction programs and those facing substantial reductions in the demand for electricity - may continue to exhibit financial problems. Utilities that have attempted to complete large nuclear projects during the presence of sharply declining load growth face severe financial problems. Prospects for the future financial health of the industry depend critically on the future demand for electricity, requirements for new generating capacity and other utility investments, and resolution of several policy issues affecting utility ratemaking, operations, and financial accounting.

39407 **(DOE/RG/10192—T1) PURPA Grant Program. Final report, October 1, 1979-January 31, 1982.** (Iowa State Commerce Commission, Des Moines (USA)). Jul 1982. Contract FG01-79RG10192. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015221.

In fulfilling its duties and responsibilities with respect to PURPA, the Commission identified the following activities in its original proposal. For each of these standards, hearings, deliberations and final orders were to result from generic proceedings. Commission procedural rules were to apply regarding access to information and intervention. The PURPA activities under this grant are categorized as: (a) cost of service standard, (b) declining block rates standard, (c) time-of-day rates standard, (d) seasonal rates standard, (e) interruptable rates standard, (f) load management techniques, (g) automatic adjustment clauses standard, and (h) lifeline rates standard.

39408 **(EPRI-EA—4088) Selected papers on demand-side management. Final report.** Jones, D.E. (ed.). (Battelle Columbus Labs., OH (USA)). Jun 1985. 190p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920715.

This compendium (RP2381-5) contains a series of papers on the issue of demand-side management (DSM). It provides much of the background material from which EPRI's research direction in the DSM area has developed. A general description of DSM, cost-benefit analyses of four specific customer-side-of-the-meter programs, and three relevant scoping studies are described in this volume. 56 refs., 33 figs., 14 tabs.

39409 **(ORNL—6136) Analysis of the costs of fuel supply for wood-fired electric power plants in rural Liberia.** Perlack, R.D.; Barron, W.F.; Samuels, G.; Rhinelander, R.E. (Oak Ridge National Lab., TN (USA)). Jun 1985. Contract AC05-84OR21400. 66p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85015026.

In recent years the quality of rural electric services in Liberia has been declining and the future economic viability of these power stations is a growing concern. Each of the ten operating and each of the planned rural public power stations is designed to operate exclusively on gas oil (diesel fuel). Fuel expenditures by the Liberian Electricity Corporation (LEC) for the rural public stations represent a major and growing burden on the financially hard-pressed utility. Liberia has two potentially significant alternatives to oil-fired electric power for its up-country towns: small (1 to 5 MW) hydroelectric facilities, and wood-fired steam or gasifier plants (0.2 to 2 MW). Although small hydroelectric facilities appear viable for several locations, they cannot serve all locations and will require thermal back-up. The economics of supplying wood to a rural electric power plant or rural grid were evaluated under several scenarios involving: (1) different sources of the feedstock, and (2) differences in wood supply requirements for plants based on the use of steam or gasifier technology, and variation in the utilization level for such plants. With a few minor exceptions, wood energy supplies are plentiful throughout Liberia. Liberia has four different potential sources of wood fuel supply: the commercial cutting of retired rubber trees; the harvesting of secondary growth forest just prior to the land returning to temporary cultivation as part of a system of shifting agriculture; adding to the system of shifting agriculture the planting of fast-growing wood species and harvesting these trees when the land again is brought back under cultivation (generally after about five to seven years); and the establishment of commercial short-rotation wood energy plantations. Results indicate that the use of wood to fuel rural power stations is a viable economic option.

39410 **(ORNL/CON—179) Review and assessment of Bonneville Power Administration's Conservation/Load/Resource Modeling Process.** Tonn, B.; Holub, E.; Hilliard, M. (Oak Ridge National Lab., TN (USA)). May 1985. Contract AC05-84OR21400. 71p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85014886.

This report documents the conservation data flows present in the Bonneville Power Administration (BPA) Conservation/Load/Resource Modeling Process. Data flows are traced among the Office of Conservation and the Divisions of Power Forecasting, Power Resources, and Rates and through their respective models. Purposes of this review are to highlight possible inappropriate uses of conservation data in models outside of the Office of Conservation and to evaluate the conservation modeling process with the goal of identifying possible areas of improvement.

39411 (ORNL/Sub—82-43309/1) Region-specific study of the electric utility industry. Phase I, final report. Wacaster, A.J. (ed.). (Southern States Energy Board, Atlanta, GA (USA)). Jul 1985. Contract AC05-84OR21400. 103p. NTIS, PC A06/MF A01; GPO Dep. File Number DE85015075.

This report describes the financial background of the electric utility industry in VACAR, reports on the present condition of the industry and then assesses the future of this industry. The Virginia-Carolinas subregion (VACAR) of the Southeastern Electric Reliability Council (SERC) was selected for this regional study because of its cooperativeness and its representative mix of powerplants, for example coal, hydro, nuclear, oil. It was found that the supply of future economic electricity is in jeopardy because of the regulatory process, the increasing risk associated with large scale generating stations and the weakening of the nuclear option. A number of options for the future were considered, including deregulation, government ownership and retaining the present system with modifications. The option selected to improve the present condition of the electricity industry was to make the present system work. The present system is sound, and with modifications, problems could be solved within the existing framework. 8 figs., 4 tabs.

39412 (ORNL/Sub—82-43309/2) Region-specific study of the electric utility industry: financial history and future power requirements for the VACAR region. Pochan, M.J. (Energy Impact Associates, Inc., Pittsburgh, PA (USA)). Jul 1985. Contract AC05-84OR21400. 193p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE85015073.

Financial data for the period 1966 to 1981 are presented for the four investor-owned electric utilities in the VACAR (Virginia-Carolinas) region. This region was selected as representative for the purpose of assessing the availability, reliability, and cost of electric power for the future in the United States. The estimated demand for power and planned additions to generating capacity for the region through the year 2000 are also given.

39413 (ORNL/Sub—82-43309/3) Region-specific study of the electric utility industry: problem identification, analysis, and recommendations. Pochan, M.J. (Energy Impact Associates, Inc., Pittsburgh, PA (USA)). Jul 1985. Contract AC05-84OR21400. 180p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE85015074.

A number of problems were identified that could stand in the way of maintaining an adequate, reliable and economic supply of electric power for the United States in the future. The problems were analyzed by studying a specific region, VACAR (Virginia-Carolinas), in some detail. It was concluded that the future power supply is in jeopardy, but that drastic changes in the present system of investor-owned utilities, specifically, deregulation or government ownership, were not justified. It was recommended that the present electric system be modified and strengthened to meet future needs. 2 refs., 8 figs., 15 tabs.

2980 Consumption And Utilization

REFER ALSO TO CITATION(S) 38724, 39440, 39451

39414 (DOE/EIA—0035(85/04)) Monthly Energy Review, April 1985. (USDOE Energy Information Administration, Washington, DC. Office of Energy Markets and End Use). Jul 1985. 132p. NTIS, PC A07/MF A01 - GPO; GPO Dep. File Number DE85015831.

This report presents current data on production, consumption, stocks, imports, exports, and prices of the principal energy commodities in the United States. Also included are data on international production of crude oil, consumption of petroleum, petroleum products, petroleum stocks, and production of electricity from nuclear-powered facilities. Energy commodities include petroleum, natural gas, coal, nuclear, and electric power.

39415 (DOE/EIA—0246(83)) Nonresidential Buildings Energy Consumption Survey: characteristics of commercial buildings, 1983. (USDOE Energy Information Administration, Washington, DC. Office of Energy Markets and End Use). Jul 1985. 188p. NTIS, PC A09/MF A01; 1 - GPO; GPO Dep. File Number DE85015590.

This report presents data collected in the 1983 Nonresidential Buildings Energy Consumption Survey (NBECS), the second national sample survey of nonresidential buildings and their fuel suppliers conducted by the Energy Information Administration. Geographically, the surveys covered the 48 contiguous States and the District of Columbia. NBECS was designed primarily to provide information on energy-related characteristics of buildings, as well as information on the consumption of an expenditures for energy used in nonresidential buildings, primarily those in the commercial sector. For both surveys, "Nonresidential buildings" was defined as roofed and walled structures that housed some kind of commercial or industrial activity, excluding buildings on military installations. Buildings that were primarily residential, but showed evidence of commercial or industrial activity also fell within the scope of the survey. The data presented in this report cover basic descriptions of commercial buildings, including principal activities, age and size of buildings, location, and occupancy patterns; energy sources used in commercial buildings; heating and cooling practices and equipment; and conservation practices. On the basis of the sample of buildings included in both the 1979 and the 1983 NBECS, data are also provided for changes that occurred between 1979 and 1983 for a few important building characteristics, such as changes in fuels supplied to the building and changes in the percentage of heated floor space. 7 figs., 46 tabs.

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 38995, 39003, 39381, 39382, 39383, 39384

39416 (NP—5901700) Methane resource assessment for Hawaii. Wong, Y.T.A. (Hawaii State Dept. of Planning and Economic Development, Honolulu (USA). Div. of Energy). Aug 1984. 86p. NTIS, PC A05/MF A01. File Number DE85901700.

This report presents an assessment of the scope and potential use of methane, a gas produced from animal wastes, wastewater treatment plants and sanitary landfills in the State of Hawaii. It is based primarily on state-of-the-art information. A statewide assessment of methane generating sources was conducted and use of the by-products of anaerobic treatment processes was evaluated. It has been estimated that 3.415 x 10^9 Btu per day or 28,496 gallons of gasoline equivalent per day (worth $11 million a year @ $1/gallon), could be produced from animal wastes, wastewater treatment plants and sanitary landfills. This renewable energy technology is one of the means available in Hawaii for providing an attractive alternative for both energy production and pollution control. Recommendations deemed necessary for research, development and demonstration projects to develop an adequate data base are offered. Follow-up studies can now proceed, using more in-depth engineering evaluation of the various sources described. Overall, it is shown that animal wastes and wastewater treatment plants and some sanitary landfill operations for gas recovery are technically feasible energy alternatives which can become economically viable sources of fuel in Hawaii. 26 refs., 5 figs., 20 tabs.

30 DIRECT ENERGY CONVERSION

3001 Mhd Generators

REFER ALSO TO CITATION(S) 39073

39417 (CONF-850666—2) Thermal radiation from potassium atoms in MHD systems. Wang, C.S.; Chow, L.S.H.; Smyk, E.B. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 15p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014979.

From 23. symposium on engineering aspects of magnetohydrodynamics; Somerset, PA, USA (25 Jun 1985).

The effect of potassium atoms on gas radiation was experimentally investigated. Combustion tests burning No. 2 fuel oil with and without potassium were conducted. Test data were interpreted by a radiant heat transfer model that calculates the effective gas emissivity and absorptivity from carbon dioxide, water vapor,

carbon monoxide, and potassium atoms and the resulting heat flux. For combustion gases without potassium, the gas emissivities calculated using the model were in good agreement with those obtained from the Hottel charts. For combustion gases with potassium, the radiant heat fluxes calculated using the model were in reasonable agreement with the measurements. Using the partially validated radiant heat transfer model, calculations were performed to provide gas emissivity data (from carbon dioxide, water vapor, and potassium atoms) for components of coal-fired magnetohydrodynamic power generating plants with mean beam lengths up to 9 m (30 ft). 9 refs., 5 figs., 4 tabs.

39418 **(DOE/ID/01745—T6) [Component Development and Integration Facility operations]. Quarterly technical progress report, April 1-June 30, 1985.** (Mountain States Energy, Inc., Butte, MT (USA)). 1985. Contract AC07-78ID01745. 16p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015546.

This quarterly technical progress report presents the tasks accomplished at the Component Development and Integration Facility during the third quarter of FY85. Areas of progress included: Coal System operation; test bay modification; plant availability enhancement; 1A channel refurbishment; independent test activity; preparation for power generation; coal-fired combustor (CFC) characterization test reporting; instrument characterization and error analysis; and plasma conductivity testing.

39419 **(DOE/PC/70507—3) MHD channel component development. Quarterly report, October-December 1984.** (Avco-Everett Research Lab., Everett, MA (USA)). Feb 1985. Contract AC22-84PC70507. 95p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85014745.

The principal technical effort performed during this quarter was the completion of the experimental verification of the diagonally loaded channel link resistor model. The results of this comparison have demonstrated good agreement between the analytical model and the experimental results. A third series of experiments in conjunction with Mississippi State University (MSU) was conducted at the AERL Mk VI facility to test the MSU laser doppler velocimeter (LDV). The purpose of the test was to measure the gas velocity in the entrance region of the diffuser and to compare the LDV measurement with a concurrent measurement made with the AERL stagnation pressure probe. This test was not successful because the LDV system was insensitive to known variations in the gas conditions which were correctly measured by the stagnation pressure probe. MSU is currently investigating the problems associated with the LDV system. Results of recent channel sidewall development tests indicate that aluminum is the best long duration material near the anode wall while copper with tungsten-copper, tungsten or molybdenum cladding provides the best corrosion resistance near the cathode wall. Diagonal bar and peg wall construction have been tested and their relative performance and duration advantages are compared. An inadvertent but severe internal electric fault in the channel - caused by an operator error - is described. The channel tolerated this fault for several minutes without loss of performance or structural damage and without requiring shutdown. 10 refs., 49 figs.

39420 **(STDR—84-28) [Advanced Power Train program analysis]. Quarterly summary, October-December 1984.** (Standard Research Corp., Arcadia, CA (USA)). 1984. Contract AC22-83PC60576. 2p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85005214.

Pending a firm date for the anticipated direct measurements of the secondary flow strength in the Avco Mark VI high interaction experiments with Mississippi State University instrumentation, STD Research Corporation has limited its three-dimensional analysis of the Mark VI experiments to simulations of data already obtained. Neither the simulations nor the experimental data indicate the formation of the kind of strong current constriction on either electrode that was observed in the STD prediction and subsequent observations at the AEDC High Performance Demonstration Experiment. The nominal conditions of the direct measurements of MHD-induced secondary flows at Stanford University have been simulated with three-dimensional MHD codes. Preliminary indications are that there is satisfactory agreement between the simulation and the measurements of the qualitative behavior and quantitative data. Following the STD simulation, and at the suggestion of STD, the Stanford experimenters looked for and found axial velocity profile skewing over the electrodes. As shown by the simulations, this skewing is caused by the MHD-driven secondary flows; such skewing has important implications for the performance of such high performance MHD generators as are being considered for the proof-of-concept demonstration. More definitive experiments have been carried out recently at Stanford, and STD is working to complete detailed simulations of the new experimental conditions so that a detailed comparison of measured and calculated values may be carried out. While the STD/MHD codes have been validated previously at similar levels of MHD interaction, the simulations of the Stanford experiments have extended the range of validation to very low speeds and small scales.

3004 Thermionic Converters

39421 **(DOE/ET/11292—1893-Vol.1) Advanced Thermionic Technology Program: summary report. Volume 1. Final report.** (Thermo Electron Corp., Waltham, MA (USA); Rasor Associates, Inc., Sunnyvale, CA (USA)). Oct 1984. Contract AC02-76ET11292;AC21-83MC20352. 45p. (TE—4258-5-84-Vol.1). NTIS, PC A03/MF A01; GPO Dep. File Number DE85009358.

This report summarizes the progress made by the Advanced Thermionic Technology Program during the past several years. This program, sponsored by the US Department of Energy, has had as its goal adapting thermionic devices to generate electricity in a terrestrial (i.e., combustion) environment. The technology has previously been developed for astronautical applications. The report is organized in four volumes, each focused as much as possible on the needs of a particular audience. Volume 1 contains Part A, the Executive Summary. This Executive Summary describes the accomplishments of the Program in brief, but assumes the reader's familiarity with the thermionic process and the technical issues associated with the Program. For this reason, Volume 1 also contains Part B, a minimally technical overview of the Advanced Thermionic Technology Program. Volume 2 (Part C) concentrates on the progress made in developing and fabricating the "current generation" of chemical vapor deposited hot shell thermionic converters and is addressed to those primarily concerned with today's capabilities in terrestrial thermionic technology. Volume 3 (Part D) contains the results of systems studies of primary interest to those involved in identifying and evaluating applications for thermionics. Volume 4 (Part E) is a highly technical discussion of the attempts made by the program to push the state-of-the-art beyond the current generation of converters and is directed toward potential researchers engaged in this same task. These technical discussions are complemented with Appendices where appropriate.

39422 **(DOE/ET/11292—1893-Vol.2) Advanced Thermionic Technology Program: summary report. Volume 2. Final report.** (Thermo Electron Corp., Waltham, MA (USA); Rasor Associates, Inc., Sunnyvale, CA (USA)). Oct 1984. Contract AC02-76ET11292;AC21-83MC20352. 206p. (TE—4258-5-84-Vol.2). NTIS, PC A10/MF A01; GPO Dep. File Number DE85009359.

This report summarizes the progress made by the Advanced Thermionic Technology Program during the past several years. This Program, sponsored by the US Department of Energy, has had as its goal adapting thermionic devices to generate electricity in a terrestrial (i.e., combustion) environment. The technology has previously been developed for astronautical applications. Volume 2 (Part C) concentrates on the progress made in developing and fabricating the "current generation" of chemical vapor deposited hot shell thermionic converters and is addressed to those primarily concerned with today's capabilities in terrestrial thermionic technology. 30 refs., 83 figs.

39423 **(DOE/ET/11292—1893-Vol.3) Advanced Thermionic Technology Program: summary report. Volume 3. Final report.** (Thermo Electron Corp., Waltham, MA (USA); Rasor Associates, Inc., Sunnyvale, CA (USA)). Oct 1984. Contract AC02-76ET11292;AC21-83MC20352. 130p. (TE—4258-5-84-Vol.3). NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE85009360.

This report summarizes the progress made by the Advanced Thermionic Technology Program during the past several years. This Program, sponsored by the US Department of Energy, has had as its goal adapting thermionic devices to generate electricity in a terrestrial (i.e., combustion) environment. Volume 3 (Part D) contains the results of systems studies of primary interest to those involved in identifying and evaluating applications for thermionics. As a general rule of thumb, cogeneration technologies are most attractive to industries when those technologies naturally produce a ration of electrical to thermal output which closely matches the demand within the industrial facilities themselves. Several of the industries which consume the largest amounts of energy have an electrical-to-thermal ratio of about ten percent, as can be seen in Exhibit D-1.1. This closely matches the electrical efficiency of thermionic converters. Thermionic cogeneration has several other unique advantages relative to alternative technologies for cogeneration which should lead to a much broader application of cogeneration in industry. These advantages accrue from the much higher temperatures at which thermionic energy conversion takes place, its suitability for very small as well as large process heaters, and, of course, its production of direct heat rather than process steam. In fact, thermionics can even be coupled to more conventional cogeneration technologies (e.g., steam turbines) to extend their applicability to processes requiring a greater electrical-to-thermal ratio than either cogeneration technology alone can provide. Several examples of thermionic cogeneration are presented in greater detail: copper refining by the Noranda process; thermionic topping cycles for gas turbine; and combined cycle and fossil-fuel steam power plants. 13 refs., 71 figs.

39424 **(DOE/ET/11292—1893-Vol.4) Advanced Thermionic Technology Program: summary report. Volume 4. Final report.** (Thermo Electron Corp., Waltham, MA (USA); Rasor Associates, Inc., Sunnyvale, CA (USA)). Oct 1984. Contract AC02-76ET11292;AC21-83MC20352. 330p. (TE—4258-5-84-Vol.4). NTIS, PC A15/MF A01; 1; GPO Dep. File Number DE85009361.

This report summarizes the progress made by the Advanced Thermionic Technology Program during the past several years. This Program, sponsored by the US Department of Energy, has had as its goal adapting thermionic devices to generate electricity in a terrestrial (i.e., combustion) environment. Volume 4 (Part E) is a highly technical discussion of the attempts made by the Program to push the state-of-the-art beyond the current generation of converters and is directed toward potential researchers engaged in this same task. These technical discussions are complemented with Appendices where appropriate.

3005 Fuel Cells

REFER ALSO TO CITATION(S) 39373

39425 **(DOE/FE/60338—14) Phosphoric and electric utility fuel cell technology development. Technical progress report No. 14 for quarter ending June 1984.** Breault, R.D.; Briggs, T.A.; Congdon, J.V.; DeMarche, T.E.; Gelting, R.L.; Goller, G.J.; Luoma, W.L.; McCloskey, M.W.; Mientek, A.P.; O'Brien, J.J. (United Technologies Corp., South Windsor, CT (USA). Power Systems Div.). 1984. Contract AC21-83FE60338. 78p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85015500.

Over 1500 hours and 15 thermal cycles were accumulated on the first 10-ft^2, 29-cell stack at 120 psia and 450°F. Assembly of the second 10-ft^2 short stack was completed and testing was initiated. Over 11,700 hours and 32 thermal cycles have been accumulated on the 3.7-ft^2, 30-cell stack at 120 psia and 405°F. Catalyst selected for the current 10-ft^2 short stack performed at the E-line goal for over 5000 hours at 120 psia and 400°F in a shop-made subscale cell. This test fulfills the 5000 hour catalyst endurance goal. Two subscale cells cut from 10-ft^2 electrodes from the same batch as used in the second 10-ft^2 short stack are performing above E-line after 1000 hours. The cross pressure evaluation of two 3.7-ft^2, seven cell ΔP rigs was completed. Automated equipment to increase processing rates and reduce manpower was used to conduct the substrate treating, catalyst deposition, matrix application and trimming operations of the 10-ft^2 electrodes for the next short stack. Work was initiated on improved edge seals. Initial trials with new powder transfer equipment indicate a 20 fold increase in powder transfer rate to the substrate forming machine. The fourth mold trial of separator plates was completed. Edge waves in separator plates were reduced with increased restraining loads. 33 figs., 10 tabs.

39426 **(EPRI-EM—4123) Fuel processor development for 11-MW fuel cell power plants.** Olesen, O.L. (United Technologies Corp., South Windsor, CT (USA)). Jul 1985. 223p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920733.

Work continues on developing a commercial phosphoric acid fuel cell power plant. This effort focused on developing and verifying key fuel processor components for an 11-MW power plant. Researchers confirmed the performance of a high-pressure reformer, a liquid fuel vaporizer, and a hydrodesulfurizer catalyst.

39427 **(EPRI-EM—4129) Molten carbonate fuel cell system verification and scale-up. Final report.** King, J.M.; Meyer, A.P.; Reiser, C.A.; Schroll, C.R. (United Technologies Corp., South Windsor, CT (USA). Power Systems Div.). Jul 1985. 205p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920734.

Tests of 1- to 2-kW molten carbonate fuel cell stacks confirm predictions that a fuel cell plant, integrated with coal gasifiers, can achieve a heat rate of 7000 Btu/kWh. Engineering development of such a plant can proceed when questions of stack durability are resolved.

39428 **(LBL—19766) Deactivation and poisoning of fuel cell catalysts.** Ross, P.N. Jr. (Lawrence Berkeley Lab., CA (USA)). Jun 1985. Contract AC03-76SF00098. 6p. (CONF-850631—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015127.

From 3. international symposium on catalyst deactivation and poisoning; Berkeley, CA, USA (19 Jun 1985).

The deactivation and poisoning phenomena reviewed are: the poisoning of anode (fuel electrode) catalyst by carbon monoxide and hydrogen sulfide; the deactivation of the cathode (air electrode) catalyst by sintering; and the deactivation of the cathode by corrosion of the support. The anode catalyst is Pt supported on a conductive, high area carbon black, usually at a loading of 10 w/o. This catalyst is tolerant to some level of carbon monoxide or hydrogen sulfide or both in combination, the level depending on temperature and pressure. Carbon monoxide poisoning has been studied extensively, including detailed adsorption studies at various temperatures and pressures. Predictive models have been developed that effectively predict anode tolerance to carbon monoxide. Much less is known about hydrogen sulfide poisoning. Typical tolerance levels are 2% CO, and 10 ppM H_2S. The cathode catalyst is typically Pt supported on a graphitic carbon black, usually a furnace black heat-treated to 2700°C. The Pt loading is typically 10 w/o, and the dispersion (or percent exposed) as-prepared is typically 30%. The loss of dispersion in use depends on the operational parameters, most especially the cathode potential history, i.e. higher potentials cause more rapid decrease in dispersion. The mechanism of loss of dispersion is not well known. The graphitic carbon support corrodes at a finite rate that is also potential dependent. Support corrosion causes thickening of the eletrolyte film between the gas pores and the catalyst particles, which in turn causes increased diffusional resistance and performance loss. In addition, support corrosion may also cause loss of Pt into the separator. Support corrosion appears to be the life limiting factor for phosphoric acid fuel cells.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

39429 (DOE/CS/69097—T3) [Short articles on energy conservation]. Hodges, L. (Iowa State Univ. of Science and Technology, Ames (USA). Energy Extension Service). 1985. Contract FG47-80CS69097. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015916.

The following short articles are reprinted after being published in the Tri-County Times, Slater, Iowa, by Laurent Hodges of the Iowa State University Energy Extension Service: water power; small hydroelectric plants; condensation problems (three parts); energy quiz and answers; the airtight drywall approach; benefits of natural lighting; energy and Iowa's building code; heating, water heating and cooling costs in Iowa; the cost of keeping cool; and reducing the cost of keeping cool. (DLC)

39430 (DOE/NBM—5015226) FEMP Update: Federal Energy Management activities, January 1984. (Federal Energy Management Program, Washington, DC (USA)). Jan 1984. 27p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015226.

Shared savings contracts, energy conservation in federal agencies and buildings, and energy conservation tips are the focus of this newsletter. Upcoming workshops are also announced. (With this issue, this publication now covers technology transfer and professional development). (DLC)

39431 (DOE/NBM—5015230) FEMP Update: Federal Energy Management activities, January 1985. (Federal Energy Management Program, Washington, DC (USA)). Jan 1985. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015230.

Shared energy savings and energy conservation in the federal and government sector are the focus of this newsletter. Workshops are also announced. (DLC)

39432 (TVA/PE/CEM—85/48) Energy management annual report, fiscal year 1984. Brothers, S.L. Jr. (Tennessee Valley Authority, Chattanooga (USA). Div. of Conservation and Energy Management). Jan 1985. 96p. NTIS, PC A05/MF A01. File Number DE85901752.

This report is submitted to satisfy annual reporting requirements of the Federal Energy Management Program (FEMP) for FY 1984. It discusses the Tennessee Valley Authority (TVA) energy management efforts in the area of buildings and general operations, as required by the FEMP, as well as TVA's self-initiated efforts in related areas.

3201 Buildings

REFER ALSO TO CITATION(S) 39007, 39013, 39014, 39021, 39023, 39401, 39415, 39459, 39619, 39752

39433 (BHRA—85/15/XAB) Control systems and strategies for building heating: a review. Banks, T. (British Hydromechanics Research Association, Cranfield). Feb 1982. 44p. (RR—1803). NTIS, PC $30.00/MF $30.00.

The requirements of a building heating-system controller are reviewed. The means by which these requirements may be accomplished are considered in an examination of the theory behind the controllers, and a review of the control hardware used to implement it. The trends for future research are noted. A review of currently available controllers is included. An appendix gives details of the control theory necessary to understand the operation of the algorithms and gives a more analytical approach than the main text.

39434 (BMFT-FB-T—84-284) Investigation of the transferability of passive solar means in the USA to the Federal Republic of Germany. Fuhse, W.; Fuhse, A. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 192p. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE85752196.

The investigations show passive solar menas to offer a contribution to the reduction of the national energy consumption. Thanks to the high building standards the starting conditions are even better than in the USA. The approval of passive solar building does not represent difficulties (exception: buildings for living below ground level are not allowed in the FRG). Furthermore the investigations show that passive solar buildings should be adjusted carefully to the local meteorological conditions, and that the energy saving potential depends essentially on the "operation of passive solar buildings. Without night insulation, passive solar means can only be conditionally economical.

39435 (BMFT-FB-T—84-287) Demonstration project Landstuhl: Energy saving and solar energy utilization in houses. Gruber, E.; Meyer, T.; Overkott, S.; Reichert, J.; Schaefer, G.; Oswald, D.; Kroetz, T. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.); Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Karlsruhe (Germany, F.R.). Inst. fuer Systemtechnik und Innovationsforschung). Dec 1984. 100p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE85752194.

With 15 refs., 10 tabs., 3 figs. .

Within the frame of the Landstuhl Demonstration Project energy saving building concepts and techniques - especially with regard to passive solar design - in one and two-family houses will be presented to the public. The houses will be investigated with regard to efficiency and energy saving potentials. In an architectural competition (part I of the project) building designs as well as constructional and technical alternatives for the active and pasive use of solar energy and energy saving concepts have been developed. The report on hand gives a description of part II of the proejct, i.e. the phase of acquiring builders for the project, and the initial work of the realization of the houses. The first model house has been finished in October, 1983, with others following which have meanwhile been occupied by the owners. The rest of the houses are planned to be completed by the end of 1984. Part III of the project now beginning will cover measures of and research on the efficiency of the technical systems, the heating requirements, the thermal balances of the houses, the energy saving by passive gains, and the economics of the concepts. Monitoring research on the behavior of the builders and inhabitants with regard to investment decisions, living and energy saving in the houses will be carried out: obstacles, practicability, conditions of operation and limits will be explained.

39436 (DOE/CS/69097—T1) Energy savings from window replacement. Newburn, J.D. (Iowa Energy Policy Council, Des Moines (USA)). Jun 1985. Contract FG47-80CS69097. 5p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015761.

There are many valid reasons to replace windows. If they are not structurally sound, they should be replaced. New windows look nicer, can be easier to clean, and can be less likely to have condensation problems. They are usually tighter, and this can result in greater comfort and energy savings. Although they represent a relatively small portion of total air leakage, they leak in places where people are most likely to feel the leaks. Consumers who are considering window replacement should weigh the advantages of tighter windows - energy savings and increased comfort - along with other advantages, against the cost. If the consumer was interested primarily in energy savings and the windows were structurally sound, it would cost less to weatherstrip, caulk and possibly put interior storms or plastic over the windows. This could result in similar if not greater savings. This paper has examined reasonable methods for a rough prediction of energy savings that have been used by some of the most knowledgeable scientists in the field. But every house is different, hence it is not possible to give a general figure for projected energy savings due to window replacement. The more extreme the case of leakiness, the better the economic reasons for replacement. However, in most cases, the economic benefits are marginal for window replacement solely on the basis of energy savings. 11 refs., 2 tabs.

39437 **(DOE/IR/06466—T1) Planning for energy self-reliance: a case study of the District of Columbia.** Beyer, B.; Dana, C.; Fersht, E.; Plunkett, J. (Institute for Local Self Reliance, Washington, DC (USA)). [1985]. Contract FG01-78IR06466. 286p. NTIS, PC A13/MF A01; 1; GPO Dep. File Number DE85015223.

The purpose of this report is to analyze the current energy picture of the District of Columbia, and the potential for energy self-reliance. It is meant to present a conceptual framework for viewing the energy crisis from a municipal perspective, and to describe possible strategies for maximizing conservation and the use of indigenous energy resources. This report conceives of the District of Columbia as a nation. Although it has no formal trade borders, its balance of payments is of increasing interest to both local planners and residents. Payments for energy have an adverse impact on the DC's balance of payments. The District imports almost all of its energy. The city, including the United States government operations within the District, imported over $500 million in energy in 1977. Excluding the federal government, over $400 million was exported to pay for energy that year. Only a small portion of these payments found their way back to the local economy in any form, either wages, or taxes, or dividend payments. After tracing these money flows, we conclude that, in 1977, only 13 cents of the energy dollar returned to the city (only 4 cents went directly to DC residents in wages and salaries; nine cents went to the DC government as taxes). We argue in this report for a societal perspective on energy planning. Investments in energy conservation generate money savings which then "multiply" through the local economy. Energy conservation and solar energy businesses tend to be small, and therefore more locally based. They tend also to be more labor intensive, in the installation stage of the operation, than many industrial jobs. Energy conservation, energy from solid wastes and from solar energy seem to be the most likely possibilities for the district, and possibly cogeneration in some cases.

39438 **(DOE/R2/05322—T1) Energy saver draft hood. Final report.** Silva, R.N. (Silva (R.N.), Ridgewood, NJ (USA)). 22 Nov 1983. Contract FG42-81R205322. 16p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015630.

The main purpose of the project was to determine as accurately as possible the actual savings in gas obtained accurate as possible the actual savings in gas obtained by the use of a new patented draft hood. The equipment definitely saves at least 5.5% in gas as an average for the whole winter and possibly up to 12.75% plus in homes with heated basements. It seems that a house with little infiltration will have increased savings. Most importantly, the apparatus requires additional testing, through both a greater number of test sites and a greater variety of house-types based on degrees of insulation, variance in air infiltration, etc., in order to more accurately record its performance under varying conditions.

39439 **(EPRI-EM—4125) Current trends in commercial cool storage. Final report.** Hersh, H.N. (Argonne National Lab., IL (USA)). Jul 1985. Contract W-31-109-ENG-38. 221p. NTIS, PC A10/MF A01; 1 - Research Reports Center, Box 50490, Palo Alto, CA 94303; GPO Dep. File Number DE85015293.

The objectives of this study were to identify, by means of a phone-and-mail survey, recent installations of off-peak cool storage air conditioning systems in commercial buildings; to monitor new developments; and to indicate trends. This report contains descriptions of over 80 systems installed since 1981, plus findings and conclusions based on site-specific information. Analysis of the findings suggests that storage cooling systems in commercial buildings can, in many cases, offer technical and cost advantages over nonstorage systems. The detailed information should be of value to potential customers and HVAC engineers in making cooling equipment decisions that would be advantageous to customer, utility, and HVAC industry alike. 20 refs.

39440 **(EPRI-EM—4142) Survey of commercial sector demand-side management activities. Final report.** Sloane, B.D. (Synergic Resources Corp., Monroeville, PA (USA)). Jul 1985. 172p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920738.

This report provides the results of a survey designed to identify and describe utility demand-side management activities within the commercial sector. The survey was not intended to be comprehensive; it was designed to provide a sampling of the levels and types of commercial activities presently under way. Summary information is provided on 196 separate projects being conducted by 113 electric utilities. Preliminary results from these projects have been summarized as well as any identified trends in technology implementation. 19 figs., 22 tabs.

39441 **(HEDL-SA—3253-FP) Fire severity estimating software.** Larson, G.F. (Hanford Engineering Development Lab., Richland, WA (USA)). 12 Jun 1985. Contract AC06-76FF02170. 7p. (CONF-850610—31). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013729.

From Annual meeting of the American Nuclear Society; Boston, MA, USA (9 Jun 1985).

The introduction of the personal computer to the office has opened new possibilities for doing modeling and calculations in a cost effective manner. Now, evaluations of actual conditions within operating facilities can be made directly by the design or safety engineers. These evaluations contain the same level of detail as conceptual designs made for new construction, and without additional time and cost. Calculations of fire severity aid the engineer in determining if proposed modifications affect the overall safety of the facility. The fire safety study for the Fuel Cycle Plant at the Hanford Engineering Development Laboratory is the first application of this software capability. The software development and the application to this facility cost $6000. When compared to a consulting firm's charges, one application to a moderate sized facility can pay for the development. Beyond our initial use, this package provides calculational ability which we are planning to use in conjunction with the annual facility safety appraisal walk-throughs to initially update, and subsequently track all of our facilities for fire conditions. The fact that this program is user-friendly helps to reduce the amount of engineer's time that is required to perform the task. Once the initial data input is complete, the data can be updated and recalculated within minutes. The fact that this can be done with a small manpower effort opens the door to calculating real-time potentials instead of relying on an "instinctive feel" to judge the conditions in a facility. This software also takes care of printing the data in tables so that a standard format will be attained for all of our facilities.

39442 **(IKE—8-10) Energy conservation and profitability of facade insulation performed on buildings Baienfurter Weg 4-20 in Stuttgart-Birkach.** Scheirle, N.; Thoene, E. (Stuttgart Univ. (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme). May 1984. 62p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE85752204.

The authors study the effects of facade insulation of varying thickness on energy consumption and the profitability of these investments. Three multi-family houses in Stuttgart were examined which were differently insulated. Heating energy consumption of the buildings was established by means of measurements and calculations. Conclusions for comfortableness were drawn from a comparison of calculated and measured values. Heating habits changed more markedly with the best insulated buildings. Comfortableness showed rising trends with increased insulation thickness.

39443 **(LBL—17593) Energy use among the low-income elderly: a closer look.** Diamond, R.C. (Lawrence Berkeley Lab., CA (USA)). Jul 1984. Contract AC03-76SF00098. 19p. (CONF-840819—19). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015126.

From Doing better: setting an agenda for the second decade; Santa Cruz, CA, USA (14 Aug 1984).

An investigation of energy use in a public housing project for the ederly continues to turn up unexpected findings regarding the importance of occupant behavior in actual energy consumption. Detailed examination of eighteen months of utility bills for each unit in the project shows wide variation (on the order of 10-1) in both summer and winter. Because we found little correlation between individual energy use, construction quality, and reported thermostat settings, we examined additional behavioral and attitudinal data collected from interviews for clues to the large variations

observed. Factors affecting the energy used by residents as well as by groups of high and low users are presented. Differences in the residents' health and comfort, the level of satisfaction with the heating/cooling system, the degree of understanding and control exercised, attitudes toward conserving, and income and status, all appear to be variables underlying the wide divergence in energy usage. 21 refs., 12 figs.

39444 **(LBL—18669) Home energy rating systems: sample approval methodology for three tools.** Huang, Y.J.; Dickinson, J.B.; Hsui, C.; Rosenfeld, A.H.; Wagner, B.S. (Lawrence Berkeley Lab., CA (USA)). Mar 1985. Contract AC03-76SF00098. 14p. (CONF-840819—18). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014539.

From Doing better: setting an agenda for the second decade; Santa Cruz, CA, USA (14 Aug 1984).

Our experiment suggests that it is possible to assess the technical accuracy of different rating systems using a large simulation program as a standard yardstick, provided that the assumptions, as well as the modeling techniques used in developing the secondary standard, are fully documented. This is particularly important when working with rating system tools such as CALPAS3 that have very flexible inputs. For these simulation programs, the documentation must include not only the conditions being modeled, but if necessary, also the algorithms used. Based on our experience, for most calculational systems the certification procedure will require direct and close interaction between the certifying body and the rating system authors. If this certification procedure is to be workable, there needs to be sufficient general agreement on building operations assumptions, selection of a standard program, and the modeling techniques for generating the secondary standard. Thus, some national consortium of agencies and trade associations must define standard building operating conditions such as indoor thermostat setting and setback amount and duration, internal loads, window venting and shading schedules. It might also address the question of default values for furnace efficiencies and the COP for heat pumps and air conditioners at full and part load. The choice of the standard simulation program and the modeling methodology should be carefully scrutinized, and will no doubt generate some controversy. However, we feel that this approach will at least provide a benchmark for comparing various rating systems and is preferable to the current incompatibility of different systems or ad-hoc comparisons that are difficult for others to evaluate. 6 refs., 4 tabs.

39445 **(LBL—19492) Prospects for highly insulating window systems.** Arasteh, D.; Selkowitz, S. (Lawrence Berkeley Lab., CA (USA)). Apr 1985. Contract AC03-76SF00098. 16p. (CONF-8505167—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014544.

From Conference on conservation in buildings: northwest perspective; Butte, MT, USA (20 May 1985).

Windows and other fenestration systems are often considered the weakest links in energy-efficient residences. This opinion is reinforced by building standards, audit guidelines, and standard window performance evaluation techniques geared toward sizing building HVAC equipment. In this paper we show that it should be possible to design highly insulating windows ($U < 0.12$ Btu/hr-ft^2-F) with high solar transmittances ($SC > 0.6$). If we then view annual window performance from the basic perspective of control of energy flows, we conclude that it should thus be possible to develop a new generation of "super window" that will outperform the best insulated wall or roof for any orientation even in a northern climate. We review several technical approaches that suggest how such a window system might be designed and built. These include multiglazed windows having one or more low-emittance coatings and gas-filled or evacuated cavities. Another approach uses a layer of transparent silica aerogel, a microporus material having a conductivity in air of about R7 per inch. We conclude by presenting data on annual energy performance in a cold climate for a range of "super windows". 8 refs., 6 figs.

39446 **(NBS-BSS—163) Potential energy savings in residential oil-fired heating systems in the US.** Kelly, G.E.; Didion, D.A.; Quigley, D.; Collins, B. (National Bureau of Standards, Washington, DC (USA). Center for Building Technology). Dec 1984. 61p. GPO. File Number TI85901698.

Studies of the performance of residential oil-fired heating systems in the New England area from 1974 to 1977 demonstrated that significant energy savings are achievable through better maintenance and simple system modifications. These studies showed that annual tune-up of the furnace or boiler would improve the seasonal efficiency of most units, while considerable energy savings are possible by reducing the firing rate of the burner. Reduction in nozzle size with burner modification or with the installation of a new flame retention burner was found to reduce oil consumption substantially. In addition, more innovative equipment modifications such as the use of stack dampers, sealed combustion systems, and heat recovery devices also resulted in fuel savings, although to a lesser extent. Both experimental field data and results from computer simulations of furnace performance are presented. 22 refs., 7 figs., 17 tabs.

39447 **(ORNL/CON—185) Actual electricity savings for homes retrofit by the BPA Residential Weatherization Program.** Hirst, E.; White, D.; Holub, E.; Goeltz, R. (Oak Ridge National Lab., TN (USA)). Jul 1985. Contract AC05-84OR21400. 52p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85015031.

The Bonneville Power Administration operated an interim Residential Weatherization Program during 1982 and 1983 throughout the Pacific Northwest region of Washington, Oregon, Idaho, and western Montana. The program offered free home energy audits and financial incentives (usually cash rebates) to help pay for installation of recommended retrofit measures in electrically-heated homes. Almost 104 thousand homes were retrofit during the two years the program operated at a cost to BPA of almost $160 million. The purpose of this study is to analyze actual electricity savings for homes that participated in the BPA program. We examine the electricity savings achieved by these homes and the relationships between actual and predicted savings. In addition, we examine those households with anomalously large and anomalously small (negative) electricity savings. These data are viewed in several ways. First, we develop overall summary statistics, then we compare the characteristics of large and small saver homes in terms of demographic, structure, and retrofit characteristics. Finally, we develop simple regression models that explain variations across households in actual electricity savings. These analyses are conducted separately for the 1982 and 1983 participants.

39448 **(PB—85-182459/XAB) Estimation of the net energy needs for building heating.** (Centre Scientifique et Technique de la Construction, Brussels (Belgium)). Oct 1984. 57p. (In French). NTIS, PC E04/MF E04.

Contents include: building heat losses and net energy needs for building heating; temperature of no more heating and temperature without heating; practical value of the recuperation factor taking into account the shadow on windows and the thermal inertia of the building; application of the calculation method in the Walloon thermal requirements (example of calculation); Appendix: nomenclature table.

39449 **(PB—85-184877/XAB) Introduction to heat pumps.** Brundrett, G.W. (Electricity Council Research Centre, Capenhurst (UK)). May 1984. 34p. (ECRC/M—1798). NTIS, PC E04/MF E04.

Heat pumping is the use of thermodynamic cycle to extract heat from a lower temperature source and supply it to a higher temperature sink where it is useful. In doing so the purchased energy needed to drive the cycle is less than that usefully supplied. Thermodynamic cycles have been well developed over the last century for refrigeration but it is only in recent years that the heat pump application has developed. In the last 10 years there has been a rapid widening of heat pump applications for winter space heating, industrial heat recovery and dehumidification.

39450 **(PB—85-185965/XAB) Movement under emergency lighting. 1. The effect of illuminance.** Boyce, P.R. (Electricity Council Research Centre, Capenhurst (UK)). Jan 1985. 66p. (ECRC/M—1904). NTIS, PC E05/MF E05.

This memorandum describes an investigation carried out in a large open-plan office with the aim of identifying the illuminance

necessary for rapid, safe movement when the main lighting fails. In the experiment, the times taken for each subject to cover the escape route under emergency lighting were measured. Observations were also made of the manner in which the subjects moved and their opinions of the conditions were noted. This data was collected from sixty subjects in all, twelve at each illuminance condition.

39451 **(PB—85-190536/XAB) Overview of the United States commercial building population. Topical report, March-October 1984.** Bluestein, J.; DeLima, H. (Applied Management Sciences, Inc., Silver Spring, MD (USA)). Oct 1984. 76p. (C—154). NTIS, PC A05/MF A01.

The commercial sector of the U.S. economy is forecasted to grow in size and energy needs, largely due to the expanded increase in the service industry. This report provides a general description of the buildings and their energy use; however, it also offers some guidance on the relative importance of building types and energy consumption in the commercial sector. Specifically, this overview provides a national inventory of the building stock as it existed in 1979. The report summarizes the information in graphical form which includes breakdowns of the building population by size, number, and age of buildings, by building usage, and by energy consumption. The major source of information is the nonresidential Building Energy Consumption Survey (NBEC) which was conducted by the Energy Information Administration (EIA) of the Department of Energy. In addition, a major portion of the report was derived from EIA computer tapes containing information supplemental to the printed EIA reports.

39452 **(PB—85-198489/XAB) Solid-desiccant dehumidification systems for residential applications. Final report, October 1983-March 1985.** Marciniak, T.J.; Grolmes, M.A.; Epstein, M. (Fauske and Associates, Inc., Burr Ridge, IL (USA)). Mar 1985. 118p. (FAI—85/15). NTIS, PC A06/MF A01.

It is shown that gas-regenerated-desiccant dehumidifiers (GRDD) can be economically superior to vapor-compression units in the hot, humid climates of the southeast and south. Although the first cost of a GRDD unit is significantly higher than a vapor-compression dehumidifier, reduced operating costs and savings in the installed cost of smaller air-conditioning units can provide an economic means for effective humidity control. The economic benefits are dependent upon (a) the number of hours of dehumidifier operation per year and (b) electricity and natural gas cost differentials. Of secondary importance is the coefficient of performance (COP) of the units. Recommendations for additional research and development for a commercial GRDD product line are outlined.

39453 **Electricity saved in a residential weatherization pilot program.** Hirst, E.; White, D.; Geoltz, R. (Oak Ridge National Lab., TN). *Public Utilities Fortnightly;* **116**: No. 2, 27-31(25 Jul 1985).

The Bonneville Power Administration operated a residential weatherization pilot program from 1980 through 1982 which provided free home energy audits to 7200 electrically heated homes in the Pacific Northwest and gave zero-interest loans to weatherize 4100 of them at a total cost of almost $11 million. Estimates of the net energy-saving effect of the program for each year of its operation and of the comparable total energy savings indicate a slow drop in the electricity savings each year after the retrofit because of increases in electricity prices and other factors which continue. Ambiguities in the audit-only households demonstrate the importance of measuring the effects of conservation programs for several years after participation. 5 references, 5 figures, 2 tables.

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 38802

39454 **(BHRA—85/27/XAB) Power consumption data for various mixing vessel arrangements.** Buttigieg, G.L.J. (British Hydromechanics Research Association, Cranfield). May 1982. 35p. (TN—1844). NTIS, PC $30.00/MF $30.00.

The design of a mixer plant depends a great deal on the power required by the impeller to achieve a given process result. Since the plant can become a rather expensive item, it is important that its power consumption can be confidently predicted, so that the equipment is not over-sized. Also, the amount of energy that is transferred to the fluid under mix may determine the quality of the process result, so that it is equally important not to under-size the plant. This review is the result of a literature search of the empirical power data currently available to the designer of mixing vessels.

39455 **(BMFT-FB-T—84-239-Vol.1) Reduction of the energy consumption of a metallurgical plant: Increase of the use of domestic energy in connection with power supply enterprises. Pt. 1. Vol. 1 and 2.** Hoffmann, G.; Brandenstein, K. von. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 311p. (In German). NTIS (US Sales Only), PC A14/MF A01. File Number DE85752186.

The steel industry is, because of the metallurgical process technology of the liquid phases and other high temperature processes, with 10% from the primary consumption of energy in the Federal Republic of Germany an important consumer of energy. The high part of the energy costs forces to a more rational use of energy and to a change by using domestic sources of energy. An augment use of blast furnace gas and the substitution of coke-oven gas or natural gas is possible by using oxygen in high temperature processes by a simultaneously conservation of energy resources. The substitution of rich gas in hot blast stoves is possible by a preheating of fuel and air in heated heat exchangers. The use of the converter gas, also by an open space between the converter mouth and the waste heat boiler is a way of a conservation of energy resources, the same like the integration of an industrial gas turbine in the hot blast stove process. The valuation of exergy of different fuels in low temperature and high temperature processes gives indications for the right user of the fuels. The optimization of the power and steam supply in an integrated metallurgical plant in connection with an external district heating supply leads to solutions in the sense of energy management and political economy. The steel industry in Japan has because of the higher level of the energy price an advantage in the execution of measures of conservating energy resources in the opposite to the German steel industry.

39456 **(BMFT-FB-T—84-239-Vol.2) Reduction of the energy consumption of a metallurgical plant: Increase of the use of domestic energy in connection with power supply enterprises. Pt. 1 Vol. 1 and 2.** Hoffmann, G.; Brandenstein, K. von. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 293p. (In German). NTIS (US Sales Only), PC A13/MF A01. File Number DE85770304.

The steel industry is, because of the metallurgical process technology of the liquid phases and other high temperature processes, with 10% from the primary consumption of energy in the Federal Republic of Germany an important consumer of energy. The high part of the energy costs forces to a more rational use of energy and to a change by using domestic sources of energy. An augment use of blast furnace gas and the substitution of coke-oven gas or natural gas is possible by using oxygen in high temperature processes by a simultaneously conservation of energy resources. The substitution of rich gas in hot blast stoves is possible by a preheating of fuel and air in heated heat exchangers. The use of the converter gas, also by an open space between the converter mouth and the waste heat boiler is a way of a conservation of energy resources, the same like the integration of an industrial gas turbine in the hot blast stove process. The valuation of exergy of different fuels in low temperature and high temperature processes gives indications for the right user of the fuels. The optimization of the power and steam supply in an integrated metallurgical plant in connection with an external district heating supply leads to solutions in the sense of energy management and political economy. The steel industry in Japan has because of the higher level of the energy price an advantage in the execution of measures of conservating energy resources in the opposite to the German steel industry.

39457 (BMFT-FB-T—84-240) Reduction of the energy consumption of a metallurgical plant: Increase of the use of domestic energy in connection with power supply enterprises. Pt. 2. Meyer, B.; Kuhlmann, W. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 197p. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE85752187.

The purpose of the R and D project was to investigate possibilities of waste heat utilization in an iron and steel work, and of heat extraction from the in-plant power station for distribution to the SZ-BS-WF-PE area. Based on a detailed survey of heating requirements in areas considered for district heating, the routing of secondary grids was planned in this part of the study. A total of 5 variants was examined for the primary grid routing from the SZ-Hallendorf power station to the consuming areas. Single-stage and three-stage heat extraction from the existing range-type power station was studied, and optimization calculations for economic primary cycle supply temperatures were carried out. The investment costs for the proposed measures amount to DM 551 million corresponding to a specific price of DM 998/kW connected load. They would permit 150,000 tSKE of imported primary energy to be saved per year, and about 42,000 tSKE of domestic energy would be required instead. SO_2 air pollution would be reduced by 280 t p.a., and nitric oxide emission by about 1,000 t p.a. Without subsidies, however, the project would result in accumulated losses in the order of DM 133 million that could only be recovered after 17 years by future earnings.

39458 (BMFT-FB-T—84-278) Intermittent injection of reduction gas in the shaft of a Midrex plant. Foerster, E.; Papst, G.; Rauter, B.; Schwerdtfeger, J. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 57p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE85752192.

The Midrex-Process has reached a nearly optimized state with regard to energy consumption. A new development of the Hamburger Stahlwerke provides a possibility of saving another 3% in energy. The idea is to utilize the enthalpy of the hot direct reduced iron directly inside the shaft furnace. Up till now, this amount of energy has not been used. The cracking of methane, the main component of natural gas, is necessary because only the products of the cracking, CO and H_2, are able to reduce iron. The endothermic reaction needs a catalyst to enable methane to be cracked without forming soot. The direct reduced iron has a catalytic effect on this reaction, similar to that of nickel. The natural gas is injected below the reducing gas inlets. Normally the injected natural gas is driven to the center of the shaft furnace by the radially injected reducing gas. There the burden is too cool to permit further iron reduction. In this process the reducing gas injection tube for reducing gas is divided into four sectors. Each sector can be closed by a hot gas valve. In this way the natural gas is driven into that part of the shaft where the hot gas valve of the reducing gas inlet is closed. By varying the opened and closed positions of the valves with time, and energy saving of 3% and a production increase of 8% is reached using this process modification.

39459 (BMFT-FB-T—84-291) Development of a thermal heat pump to heat buildings and to utilize waste heat. Gockel, K.H.; Doerr, H.; Mostofizadeh, C.; Stopka, K.D.; Stephan, K. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.); Krupp (Friedr.) G.m.b.H., Essen (Germany, F.R.). Forschungsinstitut). Dec 1984. 212p. (In German). NTIS (US Sales Only), PC A10/MF A01. File Number DE85752199.

In this project a novel thermal heat pump was to be developed and tested whose drive system comprises a hot-fluid ejector, a force pump and a heating boiler. A suitable working fluid was selected and its characteristic values determined. The performance data of the heat pump were computed and two pilot units were designed and built, each for a heat output of approx 20 kW to examine the efficiency and operational behaviour of the hot-fluid ejectors and of the special heating boiler. The tests performed with the heating boiler showed that it can provide the heat energy to enable the heat pump to operate under all service conditions. On the basis of the design computations, hot-fluid ejectors were manufactured which were optimized in tests to give a good temperature spread between the evaporation and condensation sides at a good thermal ratio. It was shown that the thermal heat pump functioned satisfactorily. Efficiency can be improved by further modifications to the ejector components. Alternative uses of the system, e.g. waste-heat utilization, are outlined.

39460 (BMFT-FB-T—84-296) Omnibus survey in 600 bakeries. Bargel, R. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 77p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE85752198.

Within the scope of an omnibus in 600 bakeries the 'energy consumption for baking' has been investigated. By means of a questionnaire the survey was carried out according to a target random test plan based on the latest trade census. Fieldwork took place during the months of Nov./Dez. 1983. The results of the controlled and coded questionnaires are presented in form of tables. Evaluation was carried out according to 'Bundeslaendern' and number of employees. The majority of the bakers use oil (63,6%) as energy source for baking. The proportion of gas and electricity is nearly 24% each; coal and coke 2,7%. The average consumption of flower per interviewed bakery is 97.800 kilos in 1982. In the smallest bakeries (1-4 employees) 61,9% of the stoves for baking are 10 years and older, in big plants (50 and more employees) this proportion is only 22,8%. In the early hours of the morning 73,7% of the baking stoves are working on full capacity, during the morning working capacity recedes to 26,4% and in the evenings to even 1%.

39461 (DOE/R2/05121—T1) [Demonstration of refrigeration: waste heat recovery in floriculture.] Final report. (Flowers by Ford, Inc., Penns Grove, NJ (USA)). [1985]. Contract FG42-80R205121. 13p. NTIS MF A01; 2; GPO Dep. File Number DE85015649.

This project demonstrated successful operation economically over a one year period when a savings of $3208 in electric power and natural gas heating costs indicated a payback period of 3 years. The installation used conventional refrigeration and building materials. (PSB)

39462 (FRNC-TH—1998) Utilization of solar energy in industry: technical and economical evaluation, prospective. Moisan, F. (Grenoble-1 Univ., 38 (France)). Jul 1983. 146p. (In French). NTIS (US Sales Only), PC A07/MF A01. File Number DE85752291.

This document describes the present state and perspectives of solar energy concentration technologies in the industrial sector: analysis of energy position in the French industry and perspectives for 1990, short presentation of various solar technologies presently and potentially applicable in the industrial sector (distributed collector systems, heat production by tower solar utility); description and analysis of a sample investigation achieved in 1980-1981 among the potential industrial users of solar technics; evaluation of the economical feasibility conditions of solar in industry (size of the market, manufacture costs, geographical influence over integration).

39463 (PB—85-185619/XAB) High-temperature heat pumps for industry. Hodgett, D.L.; Witt, J.A. (Electricity Council Research Centre, Capenhurst (UK)). Sep 1984. 24p. (ECRC/R—1803). NTIS, PC E03/MF E03.

The paper describes the possible types of applications for high-temperature heat pumps and the technical options available for matching the heat pump to the industrial process. The criteria for the economic viability are explored and the target values for success are specified. The logic behind the search for the most appropriate applications in different industrial sectors is explained and the necessary efforts to achieve a successful transfer of technology are illustrated by the example of a high temperature heat pump for timber drying which is now in commercial operation.

39464 **(PB—85-187607) Using infrared thermography for industrial energy conservation. Final report.** Sheahen, T.P.; Haimes, Y.Y.; Ruffner, M.A.H. (National Bureau of Standards, Washington, DC (USA)). 1979. 42p. Published in Proceedings of Energy Auditing Conservation: Methods, Measurements, Management, and Case Studies Conference, Cleveland, OH., March 14, 1979, p59-100.

The experimental techniques of infrared-thermography have been used in factories to locate heat losses from furnaces, ovens and similar industrial equipment. Infrared thermography data have been used to generate temperature maps of furnaces, based on precise measurements made with a calibrated instrument. From these temperature maps, total radiation losses were calculated, and convective heat losses estimated as well. By combining these calculations with other numerically estimated losses, a full heat balance was carried out on a furnace, leaving no unaccounted amount as in typical calculations of the past. This paper explains how infrared thermography works, and gives a variety of examples from both qualitative applications (leakage, hotspot identification, etc.) and quantitative measurements of heat balances.

39465 **(PNL—5525) Sensitivity analysis of conservation opportunities in the irrigated agriculture sector of the Pacific Northwest.** Harrer, B.J. (Pacific Northwest Labs., Richland, WA (USA)). Jul 1985. Contract AC06-76RL01830. 61p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85015532.

This report summarizes the results of a sensitivity analysis of the cost effectiveness and energy-savings potential of conservation measures in the irrigation sector of the Pacific Northwest. This study examines the sensitivity of estimates of the cost effectiveness and energy-savings potential of conservation measures in the irrigation sector generated in a previous study (Harrer et al. 1985c) to changes in various types of input data parameters: reductions in purchase, installation and operating/maintenance costs for irrigation-sector conservation measures. Increases in the amounts of irrigation pumping head savings that would result from the use of the measures were also implemented in the sensitivity analysis. The assumptions used in the sensitivity analysis cause the analysis to represent a "best-case" scenario for the amount of energy that can potentially be saved through the implementation of irrigation-sector conservation measures in the Pacific Northwest and the costs per kWh saved for obtaining these savings. Under these "best-case" assumptions, it is estimated that approximately 207 average megawatts of electricity can potentially be saved by the year 2003 through the implementation of low-pressure irrigation, pump fittings redesign, increases in mainline size, and improved irrigation scheduling on new and existing irrigated acres. The majority of these savings (70%) can be obtained for a cost of 20 mills per kWh saved or less.

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 38989, 39453

39466 **(FRNC-TH—2016) Waste water treatment in an anaerobic fluidized bed reactor with immobilized cells.** Guitonas, A. (Institut National des Sciences Appliquees (INSA), 31 - Toulouse (France)). Dec 1983. 115p. (In French). NTIS (US Sales Only), PC A06/MF A01. File Number DE85752299.

Anaerobic microorganisms attached on a fluidized bed of particles allow the removal to be made with shorter retention time and lower operating temperature without plugging. The aim of this work was to study an anaerobic fluidized bed reactor with immobilized biomass and to evaluate the influence of the main operating parameters on wastewater treatment, methane production and effluent quality.

3209 Education And Public Relations

39467 **(DOE/CE/26405—T1) [Integrated Energy Systems Forum monthly meetings]. Final report.** Gatton, D. (Conference of Mayors Research and Education Foundation, Washington, DC (USA)). 7 Oct 1983. Contract FG01-82CE26405. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015222.

During the life of the IES program, including the time it was administered by NBS, a total of 288 documents were designated as numbered IES documents, reproduced and made available to IES Forum participants. The documents constituted an important part of the technical information exchange function of the IES Forum. Included were reprints of articles from journals and magazines; papers presented at IES Forum meetings; papers prepared for other meetings and conferences; reports on topics of interest; Congressional testimony; and other papers and publications of interest. Current documents were placed on the literature table at each meeting to be taken by meeting participants; they also were provided by mail upon request. In addition, a variety of magazines, newsletters and other miscellaneous literature was provided to the IES Forum by their publishers. The Conference of Mayors Research and Education Foundation was successful in its purpose of maintaining the IES Forum as an important means of exchanging technical information during the one-year grant period. At this time, the future of the IES Forum is uncertain. The IES Advisory Council is exploring the possibility of obtaining outside funding to continue the group; but there is a general feeling that the IES Forum may no longer be necessary, since the technologies promoted by the IES Forum are now generally accepted and other organizations have instituted meetings and conferences which serve a technical information exchange function.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

3301 Internal Combustion Engines

REFER ALSO TO CITATION(S) 40120

39468 **(CONF-841270—1) Technologies for reducing air pollution on the motor vehicle sector.** Zander. (V.A.G. Audi, Neckarsulm (Germany, F.R.)). 1984. 32p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE85770323.

From VDI/GFT working group; Berlin, F.R. Germany (3 Dec 1984).

Automobile traffic as a source of air pollution is compared with power plants, households, and industry. Some concepts for reducing pollutant emissions with car exhaust are presented, e.g. 1. shifting of the ignition point with lower peak temperatures of combustion and higher exhaust temperatures, 2. exhaust gas recirculation, and 3. catalyst technology. The article discusses the technical side of these concepts as well as their advantages and shortcomings with regard to emission, fuel consumption, and driving performance. Finally, the problems of introducing new laws on exhaust emissions in the EC and the role of speed limits are discussed.

39469 (EPRI-AP—3939-SR, pp 3.1-3.5) **Coal-Burning Gas Turbine Program of the Locomotive Development Committee, Bituminous Coal Research, Inc.** Yellot, J.I. (John Yellott Engineering Associates, Inc., Phoenix, AZ). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

The Locomotive Development Committee (LDC) was formed in 1944 by the presidents of the nine major coal-carrying railroads and five of the nation's largest coal companies for the purpose of developing a locomotive which could compete with diesel engine driven units. The only restriction was that the locomotive power plant should be comparable in hauling capacity with existing steam and diesel locomotives, as well as compatible with locomo-

tive dimensions. The use of a direct-fired open cycle gas turbine was proposed, with pulverized coal as the fuel, and the committee accepted this concept, despite the fact that none of its components, other than the turbine itself, existed at the time. Work was immediately initiated to demonstrate the feasibility of operating as gas turbine on pulverized coal, by using space made available at The Johns Hopkins University and procuring an aircraft-type turbosupercharger to be used in the first proof of concept. Simultaneous projects were set up at Battelle Institute to develop a full-scale combustor, to be operated at atmospheric pressure in the first stage of the development. The Institute of Gas Technology was employed to conduct further development work on the coal atomizer. By September of 1945, a very small scale prototype was in operation at The Johns Hopkins University, and the Committee was given a demonstration of the turbosupercharger operating on coal alone as its fuel. The results of these studies are presented.

39470 (EPRI-AP—3939-SR, pp 8.1-8.24) **Initial evaluation of a coal burning turbine powered vehicle system.** Stettler, R.J.; Bell, A.H. III; Shows, E.W. (General Motors Corp., Warren, MI). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

Recent developments in powdered coal technology have increased its potential as a fuel for the gas turbine engine. Coal processors have developed the capability to produce a clean, more refined powdered coal which offers the maximum utilization of the energy in coal. These developments led General Motors to investigate the use of coal to power a gas turbine vehicle. This investigation resulted in the demonstration of two passenger car vehicles powered by gas turbines running on micronized coal. Two cars were equipped to run on coal dust: a Delta 88 Oldsmobile and the Cadillac El Dorado. The driveability of both vehicles operating on micronized coal was nearly comparable to the vehicle operating with a gas turbine on diesel fuel. The main difference was detected in the slower gasifier acceleration rate due to the slower fuel delivery rate of the metering pump. Although many hours have been completed in component combustor, engine, and vehicle driveability testing, many more hours will be required to establish the cleanliness of the micronized coal fuels necessary to allow sufficient turbine hot parts life. Based on projected costs of clean coal fuels at the plant gate, a micronized coal powder can be competitive with the refinery plant gate cost of diesel fuel produced from as low as $22/bbl crude oil. The use of micronized clean coals provides the highest energy recovery of a transportation fuel from coal. The feasibility of providing a mobile system for using clean micronized coal as a fuel has been demonstrated.

39471 (EPRI-AP—3939-SR, pp 9.1-9.13) **Experimental coal-water slurry fired combustor.** White, D. (Solar Turbines, Inc., San Diego, CA). Apr 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920634.

In Direct coal-fired combustion turbines: workshop proceedings.

A novel combustion system approach has been designed for the combustion of a coal-water slurry. This combustor is designed to operate at pressures up to 10 atmos and at inlet air temperatures of the order of 650°F, which are typical operating conditions of small industrial gas turbines. Key features of this combustor are its simplified fuel injection and the toroidal vortex flow field in the primary zone. The former allows viscous slurries to be introduced and atomized, while the latter provides retention of small particles and the deposition of large ones. Operated at primary zone temperatures high enough to produce molten ash, the combustor behaves as a slagging combustor. Because of the vertical orientation of the primary zone, molten slag is readily removed. Low NO/sub x/ emissions are expected of the combustion system when operated in a rich-lean mode. Low particulate emissions are also anticipated due to the slagging mode of operation and the incorporation of an efficient carbon particle burn-out zone. At the present time the combustor is assembled in a rich-lean configuration. The rich primary zone hot face is a monolithic refractory cylinder backed with a Hastalloy-X sheet metal liner. Twisted sheet metal anchors are used to tie the linear and the refractory cylinder together. The primary dome which is located at the base of the vertical arrangement is similarly constructed from a heavy cast refractory block. A cone shaped slag removal port is located in the center of this block. Located to the side of this slag removal port is a second port for a torch ignited. This igniter is a commercial unit that is fired by either natural gas or a liquid kerosene type fuel. This system affords positive ignition of the coal-water slurry.

3307 Emission Control

REFER ALSO TO CITATION(S) 39468

3308 Alternative Fuels

39472 (CONF-841271—1) **Hydrogen drives in practice.** Gwinner, D. (Daimler-Benz A.G., Stuttgart (Germany, F.R.)). 1984. 40p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE85770324.

From Seminar on vehicle technology; Karlsruhe, F.R. Germany (11 Dec 1984).

The development of hydrogen drives for road vehicles has been one of the main fields of research of the Daimler-Benz AG in the last decade. The first practical test with a fleet of 10 Mercedes-Benz hydrogen cars was started in 1984. The test is part of the research project 'Alternative fuels for road traffic' and is to last for 18 months. Among others, the applicability of hydrogen drives in driving practice is to be demonstrated.

36 MATERIALS

REFER ALSO TO CITATION(S) 41099

39473 (DOE/ER/45133—1) **[Study of multicomponent diffusion and transport phenomena]. Progress report.** (Purdue Univ., Lafayette, IN (USA). School of Materials Engineering). 1985. Contract FG02-84ER45133. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015289.

The following were studied: demixing under chemical potential gradient, tracer diffusion in ordered alloys, thermal diffusion and related phenomena, and correlation factor in tracer diffusion for high tracer concentrations. (DLC)

39474 (LA-UR—85-2221) **Effective-cluster simulation of polycrystal plasticity.** Kocks, U.F.; Tome, C.; Canova, G.R. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 9p. (CONF-8509112—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014081.

From International conference on physical basis and modelling of finite deformation of aggregates; Paris, France (30 Sep 1985).

A model is proposed in which each grain, representative of a certain orientation and strength, is embedded in a thin shell of plastic effective medium; this assembly is called an "effective cluster". For each grain, the plastic strain increment is chosen such that the yield surface of the effective cluster gives the macroscopic stress. The results differ from uniform-strain theories only in some cases, such as in the compression of f.c.c. polycrystals, where "grain curling" occurs.

39475 (MLM—3267) **In-situ vacuum-assisted molding of glass-metal electrical components.** Kramer, D.P.; Massey, R.T. (Monsanto Research Corp., Miamisburg, OH (USA). Mound). 12 Jul 1985. Contract AC04-76DP00053. 10p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015607.

In-situ vacuum-assisted molding is an innovative processing technique, which is useful in the fabrication of complex glass or glass-ceramic-to-metal seals. During in-situ vacuum-assisted molding, molten glass is pulled with a vacuum onto the metal parts, allowing the formation of the seal. The process improves glass flow, facilitates the removal of trapped gases, and makes possible the fabrication of seals of complex geometry.

39476 (MLM—3268) Injection molding-sealing of glass to low melting metals. Kramer, D.P.; Massey, R.T.; Halcomb, D.L. (Monsanto Research Corp., Miamisburg, OH (USA). Mound). 15 Jul 1985. Contract AC04-76DP00053. 12p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015613.

Injection molding-sealing is an innovative processing technique useful in the fabrication of complex glass or glass-ceramic-to-metal seals which use low melting metals such as aluminum. During injection molding-sealing, molten glass, which may have a higher melting temperature than that of the metal parts, is injected under pressure into the metal parts while they are held in a mold. The process, which for the first time allows the formation of seals with metals that have a lower melting temperature than the glass, allows the fabrication of seals of complex geometry.

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REFER ALSO TO CITATION(S) 38682, 38790, 38837, 38837, 38922, 39079, 39110, 39111, 39129, 39251, 39251, 39366, 39610, 39729, 39750, 40450, 40489, 40720, 40921, 40930

39477 (AD—803172/6/XAB) High energy rate densification and forming of metal powders. Final report, 1 June 1963-1 June 1966. Hay, W.S. (General Dynamics Corp., Fort Worth, TX (USA)). Aug 1966. 552p. NTIS, PC A24/MF A01.

The object of the original program (Part I) was to (1) develop a production method for slip casting thin-walled shapes from tungsten powder and (2) improve the properties of powder forms by high-energy-rate (HER) densification (pneumatic-mechanical and chemical explosive) processes. A slip casting method for tungsten was developed, but attempts to HER densify powder forms were unsuccessful. The program was then revised (Part II) to develop a manufacturing method for forming parts from powdered metals or alloys directly by using HER techniques. The basic HER method developed involves (1) RT compaction of the powder to form a briquette and (2) extruding or forging this briquette after preheating to the final shape desired. Optimized techniques were developed for briquetting, free extruding, and closed-cavity extruding 4600 steel-graphite, 18-9 steel, and nickel-thoria powder. Photomicrographic analysis and tensile-test data were obtained on all specimens. Data indicates that 4600 steel-0.20% graphite HER extrusions or closed-cavity specimens had ultimate tensile strengths 15% greater than commercial 4620 steel. Nickel-thoria HER powder specimens had room-temperature strengths much higher than comparable commercial material--38% higher for extrusions and 17% for closed-cavity tensile specimens. HER formed nickel-thoria specimens had much lower hot strength (1600 - 1900 F) than the commercial product which is cold drawn. Two production-type parts were made using 4600 steel-graphite and nickel-thoria powder--one by extrusion and one by forging techniques. Although the parts as made had minor flaws, the feasibility of making small production parts by the HER technique was demonstrated.

39478 (AD-A—153135/9/XAB) Critical conditions for failure in materials subjected to high rates of loading. Final report, 15 August 1981-30 November 1984. Clifton, R.J.; Asaro, R.J.; Duffy, J.; Freund, L.B.; Needleman, A. (Brown Univ., Providence, RI (USA). Dept. of Engineering). 20 Mar 1985. 39p. NTIS, PC A03/MF A01.

Mechanisms of the plastic deformation and failure of steels under dynamic loading conditions were examined through investigations in three area: dynamic plasticity, shear bands, and fracture initiation. The dynamic plastic response of 4340 VAR steel were measured in torsion experiments at strain rates from 10^{-4} sec^{-1} and in pressure-shear experiments at strain rates of 10^{-5} sec^{-1}. Torsion experiments were conducted at temperatures from -190C to 23C on three tempers (HRC 55, 44, 33). Relatively weak strain-rate sensitivity obtained in these experiments were related to the high athermal stress barrier that must be overcome for plastic deformation at low temperatures. Temperature profiles in the vicinity of the shear bands were measured using a ten-element, infrared detector system. Numerical simulations were used to assess the roles of strain hardening, strain-rate sensitivity, thermal softening, and heat conduction on shear band formation. Finite-element methods were developed for rate-dependent plasticity and applied to calculations of failure through shear-band propagation and ductile fracture. The effects of microstructure on dynamic and quasi-static fracture initiation of AISI 1020 steel were investigated by means of our notched-round bar experiment. The results cover the temperature range -150C to 100C. For static loading under ductile conditions the results are now being supplemented by a detailed study to determine tthe instant of fracture initiation.

39479 (AD-A—153843/8/XAB) Marine corrosion. Final report. Sedriks, A.J. (Naval Research Lab., Washington, DC (USA)). 24 Apr 1985. 25p. (NRL-MR—5527). NTIS, PC A02/MF A01.

This report is a review of marine corrosion of metals and alloys which is to be included in the new Handbook of Ocean Engineering, to be published by Academic Press in 1985. The report describes marine environments, the types of marine corrosion encountered, cathodic protection and alloys used in marine applications. Emphasis is placed on describing the types of corrosion generally found and the preventative measures employed.

39480 (BNL—36699) Vacancies in thermal equilibrium in Nb. Nielsen, B.; Lynn, K.G.; Hurst, J.; Vehanen, A.; Schultz, P.J. (Brookhaven National Lab., Upton, NY (USA); Helsinki Univ. (Finland). Dept. of Physics; Western Ontario Univ., London (Canada)). Jun 1985. Contract AC02-76CH00016. 4p. (CONF-850169—18). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014832.

From 7. international conference on positron annihilation; New Delhi, India (6 Jan 1985).

We have measured the diffusion of positrons in Nb(110) in the temperature range from 300K to 2450K utilizing a variable energy positron beam. The purpose was to study the vacancy formation. However, no significant sign of vacancy trapping was observed. This could be due to a high detrapping rate caused by a low positron binding energy or due to a high vacancy formation enthalpy H/sub IV//sup F/. The last possibility is consistent with recent studies of the vacancy migration and with calculation of the positron binding energy. In this case we find the H/sub IV//sup F/ > 3 eV.

39481 (BNL—36701) 2D ACAR momentum density study of the nature of the positron surface state on Al(100). Berko, S.; Canter, K.F.; Lynn, K.G.; Mills, A.P.; Roellig, L.O.; West, R.N. (Brandeis Univ., Waltham, MA (USA); Brookhaven National Lab., Upton, NY (USA); Bell Labs., Murray Hill, NJ (USA); City Coll., New York (USA); East Anglia Univ. (UK)). 1985. Contract AC02-76CH00016. 4p. (CONF-850169—17). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014830.

From 7. international conference on positron annihilation; New Delhi, India (6 Jan 1985).

The two-dimensional angular correlation of the 2γ annihilation radiation (2D ACAR) has been measured from an Al(100) surface bombarded by 200-eV positrons. After removing the contribution of fast para-positronium annihilation, the spectrum from positrons annihilating at the surface exhibits a nearly isotropic conical shape with a (7.1 +- 0.5) mrad FWHM. 5 refs., 6 figs.

39482 (CEA-CONF—7436) Fracture mechanics limitations for short cracks and the non-propagating cracks. Stromboni, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Sep 1984. 10p. (CONF-8409121—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE85751924.

From 2. international conference on fatigue thresholds - Fatigue 84; Birmingham, UK (3 Sep 1984).

Fracture mechanics limitations when the crack length is small can be listed as metallurgical or plastical arguments. It was here defined a "non propagating cracks" criterion, based on some critical length 1sub(c) (relying $\Delta\sigma e$ and ΔKth). It is shown a comparison of theoretical and experimental results about initiation and subsequent micropropagation of short cracks at the notch root of 316 L specimen at 20°C and 550°C. It was shown that non-propagating cracks occurence could be mainly related to the closure phenomena on a mechanical point of view and to the ability of emitted

dislocations to propagate beyond the grain boundary on the metallurgical point of view.

39483 (CEA-CONF—7500) Influence of irradiation defects on anelastic properties of magnesium. Minier, C.; Haneczok, G.; Lauzier, J. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)). Jan 1985. 16p. (CONF-850172—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE85751944.

From Symposium on anelastic relaxations and magnetic after effect in solids - Reniom 84; Kattowice, Poland (24 Jan 1985).

Irradiation defects in magnesium and their interactions with dislocations are studied by internal friction and elastic modulus. Long distance migration of different defects are determined. Relaxation peaks at very low temperature are analyzed. In the interaction peak between defects and dislocations it is shown that defects are interstitials and that dislocations are responsible for the peak B_1 and the interaction mechanism is probably associated to a side motion of defects along the lines. Defects brought by irradiation on dislocations are used for testing Bordoni relaxation theory and variation of parameters of peak B_1 and B_2 are analyzed.

39484 (CEA-R—5239) Enbrittlement of the U-7,5 Nb-2,5 Zr uranium alloy in gaseous environments. Lepoutre, D. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France); Paris-6 Univ., 75 (France)). Oct 1984. 304p. (In French). NTIS (US Sales Only), PC A14/MF A01. File Number DE85751941.

Stress corrosion cracking in air, oxygen, hydrogen, water, carbon dioxide of an uranium alloy U 7.5 Nb 2.5 Zr is experimentally studied. The stress corrosion tests are performed with fatigue precracked Single Edge Notched specimens, and the Linear Elastic Fracture Mechanic concept is used to describe the stress state at the crack tip. The s.c.c. maps and the cracking kinetics are determined as a function of stress intensity factor, temperature and pressure. In oxygen, an embrittlement is observed in all the tests, for any temperature and pressure; cracking is transgranular and thermally activated. We propose a model which takes in account the concomitant buildup of an oxide film and niobium interfacial segregated zone. In hydrogen, an embrittlement is observed only at low pressure: hydriding occurs at high pressure. A brittle phase failure mechanism is proposed to explain the embrittling effect of hydrogen. Cracking in oxygen at low pressure is inhibited by water and carbon dioxide. Finally oxygen is the specie responsible for cracking in laboratory air.

39485 (CEA-R—5283) Role of the electronic structure in the relative easiness of the glide systems in hexagonal close-packed metals. Legrand, B. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France); Paris-6 Univ., 75 (France)). Nov 1984. 179p. (In French). NTIS (US Sales Only), PC A09/MF A01. File Number DE85751998.

We have studied experimentally the slip systems of hexagonal close-packed (H.C.P.) rare earths single crystals (Tb, Dy and Er). In these metals the main glide system (M.G.S.) is the prismatic one, as in more than half of the H.C.P. metals. We show that the electronic structure of the matrix plays a direct role in the choice of the glide system in H.C.P. metals. We have calculated the basal and the prismatic stacking fault energy with pseudopotentials for divalent simple metals and a tight-binding model for transition metals. We have shown that there is an excellent agreement between the ratio (basal S.F.E./prismatic S.F.E.) and the main glide systems observed. We have then simulated the core structure of the screw dislocation 1/3 <1 1 -2 0> with the tight-binding model for Titanium. We obtain a nonplanar core structure which explains well the most important characteristics of the prismatic glide in this metal: the low mobility of the screw dislocation and the breakdown of the Schmid law for the critical resolved shear stress.

39486 (CEA-R—5291) Irradiation defects in the A-15 compounds V_3Si and Nb_3Ge: effects on superconducting and transport properties. Rullier-Albenque, F. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France); Paris-6 Univ., 75 (France)). Nov 1984. 169p. (In French). NTIS (US Sales Only), PC A08/MF A01. File Number DE85751940.

In the first part the mechanisms of atomic displacements under electron irradiation in these diatomic ordered solids are studied. In the case of superconducting alloys, simultaneous measurements of electrical resistivity at 20 K and critical temperature allow to distinguish the influence of point defects created in each sub-lattice and antisite defects. The threshold energies have been determined. In the case of V_3Si, Frenkel pairs have been characterized by their specific resistivities and the decrease of Tsub(c) by vanadium vacancies. The Tsub(c) results obtained on V_3Si also reveal the existence of a threshold electron energy to produce antisite defects. The second part is a comparative study of irradiation effects in Nb_3Ge with very different kinds of projectiles: 2.5 MeV electrons, fast neutrons or 100 MeV heavy ions (uranium fission fragments). For these three types of irradiation, resistivity and critical temperature damage can be described in terms of point defects: Frenkel pairs and antisite defects. In the third part we have studied the influence of 2.5 MeV electron or fission fragment-irradiation on the resistivity versus temperature curves of Nb_3Ge. For both projectiles, negative temperature coefficients of resistivity drho)/dT, were measured and correlated with resistivity at 280 K and 25 K. These anomalous transport properties are related to an electron localization process assisted by electron-phonon and electron-electron interaction.

39487 (CEA-R—5292) Electron microscopy of some irradiated solids. Housseau, N. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France); Poitiers Univ., 86 (France)). Jan 1985. 89p. (In French). NTIS (US Sales Only), PC A05/MF A01. File Number DE85751996.

Studied are defects induced by "in situ" irradiation in a High Tension Electron Microscope (1MV) in various materials such as: metals and usual alloys for nuclear reactors, low dimensional conductors, organic conductors. The migration energy for interstitial in stainless steels is 0.8 eV for a synthetic austenitic steel and 2.0 eV for an industrial titanium steel. Irradiation damage of low dimensional compounds, TaS_2 and TaS_3 are studied as a function of temperature and irradiation dose. Modifications of surstructure diffraction spots and the progressive disappearance of ordered phases of Charge Density Wave are observed. Electron diffraction pattern of crystalline organic compouds very sensitive to irradiation are obtained at 7K. Classification according to decreaseing sensitivity is Qsub(n)-$(TCNQ)_2$ → TM-TSF-DM-TCNQ → TTF-TCNQ → TTT_2I_3.

39488 (CNEA-NT—19/82) Distribution Function of Crystalline Orientation's usefulness in crystallographic texture analysis. Hermida, J.D.; Pochettino, A.A. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina)). 1982. 27p. (In Spanish). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701907.

The theoretical fundaments of the Distribution Function of Crystalline Orientations (DFCO) are described and this method is compared with the usual description of the crystallographic texture by direct pole figures. Such function is applied to the study of a Zry-4 sample obtained from a tube belonging to a CANDU type fuel element. The DFCO is obtained from the pole figures (0002), (101-bar0) and (101-bar1). The results show the existence of six fundamental components of texture, which are enunciated below, in decreasing order of importance: (2-bar115) <101-bar0>; (3-bar128) <15-bar40>; (1-bar013) <12-bar10>; (2-bar114) <01-bar10>; (0001) <01-bar10>; (0001) <12-bar10>. A much more complete view of the crystals' orientation state of such sample can be obtained by analyzing the weight and the distribution of the different components.

39489 (CONF-850890—10) New interpretation of spin-wave behavior in nickel and iron. Cooke, J.F.; Blackman, J.A.; Morgan, T. (Oak Ridge National Lab., TN (USA); Reading Univ. (UK)). Jul 1985. Contract AC05-84OR21400. 30p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015323.

From International conference on magnetism; San Francisco, CA, USA (26 Aug 1985).

Calculations of the dynamic susceptibility based on itinerant electron theory for energies up to 1 eV have led to a new picture of spin-wave behavior in nickel and iron, in which spin-waves exist

throughout most of the Brillouin zone and to much higher energies than previously thought possible.

39490 **(CONF-8505138—10) Mossbauer effect and neutron diffraction study of the anomalous lattice behavior of U_6Fe.** Vaishnava, P.P.; Dwight, A.E.; Kimball, C.W.; Jorgensen, J.D.; Fradin, F.Y. (Northern Illinois Univ., Dekalb (USA); Argonne National Lab., IL (USA)). Jun 1985. Contract W-31-109-ENG-38. 13p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014912.

From Materials and mechanisms of superconductivity conference; Ames, IA, USA (29 May 1985).

Neutron diffraction and ^{57}Fe Moessbauer effect measurements have been made on the exchange-enhanced superconductor U_6Fe. The neutron diffraction results indicate a pronounced anisotropy in the thermal expansion of the unit cell and an anomalous temperature dependence for the c-axis component of the total Debye-Waller factor of Fe below 100K. The Moessbauer effect measurements show non-Debye behavior in the mean-squared displacement of Fe, with phonon hardening occurring below 100K. The absence of a temperature dependence to the relative intensities of the lines in the Fe quadrupole doublet indicates almost isotropic lattice vibrations. Taken together these observations imply that Fe undergoes static displacements along the c-axis that begin below 100K and increase with decreasing temperature. Both the Moessbauer shift and the quadrupole coupling indicate electronic changes in the valence of Fe in the temperature region in which the displacement takes place.

39491 **(CONF-8505138—12) Analysis of the series of moderately heavy fermion materials: $CeSn_3$, USn_3, and $NpSn_3$.** Norman, M.R.; Koelling, D.D. (Argonne National Lab., IL (USA)). May 1985. Contract W-31-109-ENG-38. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014973.

From Materials and mechanisms of superconductivity conference; Ames, IA, USA (29 May 1985).

The materials $CeSn_3$, USn_3, and $NpSn_3$ are all moderately heavy Fermion compounds with electronic specific heat coefficients of 73, 169, and 242 mJ/mole K^2. $CeSn_3$ is known as a mixed valent system and $NpSn_3$ is a weak itinerant antiferromagnet. All three are strongly enhanced. Being in the relatively simple Au_3Cu structure, they form an excellent set of materials to study as representatives of strongly enhanced systems. One would like to ascertain what properties can be determined from band calculations based on density functional theory in the local density approximation. It has already been shown that the Fermi surface topology of $CeSn_3$ can be well described in this way even though the experimental masses are much larger than the band results. The enhancement factor for USn_3 is even larger and $NpSN_3$ is indeed predicted to go magnetic. We present here fully relativistic SCF calculations for these materials and discuss the relation between our results and what is known experimentally.

39492 **(CONF-8506144—3) Dense random packed model for amorphous $Ni_{35}Zr_{65}$: influence of the heat of mixing.** Saw, C.K.; Schwarz, R.B. (Argonne National Lab., IL (USA)). May 1985. Contract W-31-109-ENG-38. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014967.

From International conference on the theory of the structures of non-crystalline solids; Bloomfield Hills, MI, USA (3 Jun 1985).

The structure of amorphous $Ni_{35}Zr_{65}$ alloy was simulated by a Dense Random Packed (DRP) model. The model was relaxed by minimizing its elastic energy through the use of a modified Keating potential that included only central forces with interatomic bonds of equal strength. The Bathia-Thornton number concentration (NC) distributions and the Warren chemical short range order parameter, α/sub w/, were deduced from the model and compared with measurements in rapidly quenched $Ni_{35}Zr_{65}$. The DRP model simulates a truly random alloy for which α/sub w/ = 0. Since α/sub w/ = -0.04 for the actual alloy, the fraction of Ni-Zr nearest neighbors in the alloy exceeds that in the model. The effects of decreasing the strength of any one of the interatomic bonds (Ni-Ni, Ni-Zr, or Zr-Zr) were investigated. It was found that the bond relaxations cause a sharpening of some of the peaks in NC distributions but have no effect on the value of α/sub w/. The effect of permuting Ni and Zr atoms, so as to increase the number of Ni-Zr nearest neighbors at the expense of Ni-Ni and Zr-Zr pairs, was also investigated. It was found that these permutations improve the agreement between the calculated and the measured NC distributions and generate an α/sub w/ value of -0.038.

39493 **(CONF-8509102—1) Itinerant electron ferromagnetism in Fe-alloyed, Ni_3Al based materials.** Thompson, J.R.; Kerchner, H.R.; Sekula, S.T. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85013989.

From International conference on magnetism; San Francisco, CA, USA (26 Sep 1985).

Bulk magnetic properties of Ni_3Al-based alloys containing up to 10 at.% Fe have been investigated. The experimental results are compared with those for off-stoichiometry Ni_3Al and interpreted using Stoner and SCR spin fluctuation theory.

39494 **(DOE/ER/10107—28) Miniaturization of specimens for mechanical testing.** Harling, O.K.; Kohse, G. (Massachusetts Inst. of Tech., Cambridge (USA). Nuclear Reactor Lab.). 17 Jun 1985. Contract AC02-78ER10107. 30p. (CONF-8506165—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85014506.

From Workshop on the relation between mechanical properties and micro-structure under fusion irradiation conditions; Ebeltoft, Denmark (27 Jun 1985).

The development of mechanical property tests based on bending of a 3 mm diameter by (typically) 0.25 mm thick disk is described. Slow strain rate testing of such a disk is used to obtain tensile properties. Finite element computer modeling is used to extract yield stress values with accuracies of at least +-10% of uniaxial tensile test values for a variety of materials. Analytical estimates of ductility from disk bend test values are possible for low-ductility materials. Work directed toward finite element calculations for ductility and ultimate tensile strength is also discussed. Preliminary data indicating the feasibility of high strain rate testing for estimation of ductile-to-brittle transition temperatures, and an example of the successful application of miniature bend testing in obtaining relative fatigue information are also presented.

39495 **(DOE/ER/45025—7) Metallic multilayers and superlattices.** Falco, C.M. (Arizona Univ., Tucson (USA)). 1985. Contract AC02-83ER45025. 11p. (CONF-8503152—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014444.

From 5. European Physical Society general conference of Condensed Matter Division; West Berlin, Germany D.R. (18 Mar 1985).

An introduction to metal-metal multilayers and superlattices is presented, along with a brief review of some of the materials which have been made in our lab, and phenomena which have been observed so far. Results of a number of x-ray structural characterization techniques applied to these materials are described. These include Bragg Θ-2Θ x-ray diffraction, transmission and reflection Laue diffraction, and wide-film Debye-Scherrer diffraction. Emphasis is placed on recent results obtained in our laboratory with multilayers and superlattices produced by sputtering techniques.

39496 **(DOE/ER/45098—8) Synchrotron radiation and x-ray topography. Part II. Examples of some applications.** Bilello, J.C. (State Univ. of New York, Stony Brook (USA). Dept. of Materials Science and Engineering). 1985. Contract FG02-84ER45098. 12p. (CONF-850897—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015596.

From Mechanical properties and behaviour of solids; Trieste, Italy (12 Aug 1985).

Synchrotron x-radiation topography is a powerful tool for studying defects in "bulk" metals and alloys. The general features of this technique, including both advantages and disadvantages, have been discussed in Part I of this review. This second report concentrates on some applications of the white beam topography method to studies of flow and fracture of materials and indicates fruitful areas for possible future application. Research investigations on cleavage surfaces of some bcc and hcp metals and alloys are re-

viewed and contrasted to other more usual methods of studying the morphology of the resulting microstructures.

39497 **(DOE/ER/45184—1) Influence of grain boundary chemistry and structure on the intergranular attack and intergranular stress corrosion cracking of austenitic alloys. Progress report, December 1, 1984-July 31, 1985.** Was, G.S. (Michigan Univ., Ann Arbor (USA)). Jul 1985. Contract FG02-85ER45184. 37p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015559.

Grain boundaries of Ni-Cr-Fe alloys were studied and heat treatments developed. A polarization-sensitive detector is under development. A study was made of intragranular precipitation and chromium banding. Low-temperature stress corrosion tests in tetrathionate solutions showed that Cr levels below 5% resulted in 100% intergranular fracture. Polarization experiments were also conducted. Preliminary tests were performed to measure the influence of grain boundary phosphorus on hydrogen embrittlement. (DLC)

39498 **(EGG-M—16385) Life extension of components with high cumulative fatigue usage.** Server, W.L. (EG and G Idaho, Inc., Idaho Falls (USA)). 1985. Contract AC07-76ID01570. 9p. (CONF-850713—2). NTIS, PC A02/MF A01 - GPO; GPO Dep. File Number TI85014631.

From International conference on nuclear power plant aging, availability factor and reliability analysis; San Diego, CA, USA (3 Jul 1985).

The current ASME Boiler and Pressure Vessel Code fatigue design approach has significant margins of safety as evidenced by fatigue data on full-scale vessels. In order to extend qualification (life) of components which have reached the Code design usage limit of unity, improved criteria are needed which address crack initiation and propagation separately such that safe operation of these components is ensured. The fatigue initiation phase is composed of two processes: initial microcracking of internal particles or accumulation of local strain (cyclic slip) creating discontinuities which form microcracks, and the growth of the microcracks in a noncontinuum manner. The microcracks which initiate will eventually grow to a size in which continuum mechanics apply, and fracture mechanics concepts have been employed. The later propagation to failure of a component is also composed of two parts, continuum crack growth in a stable manner and eventual unstable fracture of the remaining ligament of material. This paper reviews the current status of technology in assessing initiation and propagation relative to the current design Code and suggests areas of improvement to cover extended life of high usage factor components. To illustrate some of these considerations, a case study for a small manufacturing defect was reviewed. A realistic component was analyzed to investigate the interrelationship between the ASME Code Section III design life and crack propagation behavior of a small manufacturing defect. A pressurized water reactor (PWR) primary coolant system was used in the analysis, and the terminal end of the hot-leg pipe at the safe end weld was selected since usage factors as high as 0.95 had been reported. The particular plant chosen was Zion-1 because the necessary information on loading, including thermal transients, was available in the open literature. 11 refs., 1 fig., 1 tab.

39499 **(EPRI-EM—4130) Resistance heating of metals: state-of-the-art assessment. Final report.** Lalwaney, N.S. (Battelle Columbus Labs., OH (USA)). Jul 1985. 66p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920735.

Resistance heating is an electrotechnology that combines the basic attributes of electric heat with the ability to provide efficient temperature control up to 5425°F (3000°C). As a result, resistance heating is widely used in many industrial markets. It is a mature electrotechnology, and future developments will likely be evolutionary. Apart from mechanical automation for material handling systems, the trend to automate overall processing will continue. With the move to automation and the need for reliable control of processes, resistance heating will continue to find important application in a variety of manufacturing operations. Heating unit sales are projected to grow 5% per year.

39500 **(EPRI-EM—4132) Vacuum melting of metals: state-of-the-art assessment. Final report.** Pattee, H.E. (Battelle Columbus Labs., OH (USA)). Jul 1985. 64p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920737.

This assessment of the state of the art of vacuum melting technologies as applied to melting and refining of metals has shown that: (1) the largest markets for these technologies lie in areas where there is no competing technology (the production of metals with high chemical reactivity) or in areas where the benefits outweigh the added costs of vacuum processing (the production of superalloys); (2) the economics of vacuum technologies in these applications indicate a steady demand for their continued use. Because of their mature nature, the projected growth appears to be small (no more than 5% yearly); and (3) competition from other refining processes, electroslag remelting and ladle refining, does not appear to present a serious threat to their use.

39501 **(EPRI-NP—4078M) Stress corrosion cracking and corrosion fatigue of sensitized Type-304 stainless steel in simulated BWR environments.** Macdonald, D.D.; Szklarska-Smialowska, Z.; Cragnolino, G. (Ohio State Univ., Columbus (USA). Dept. of Metallurgical Engineering). Jun 1985. 81p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920722.

The effect of potential and temperature on the IGSCC of furnace sensitized Type 304 stainless steel in dilute aqueous solutions containing a variety of electrolytes, such as Na_2SO_4, Na_2SO_4 + H_2SO_4, NaCl, $B(OH)_3$ + LiOH, and Na_2HPO_4 + NaH_2PO_4, has been studied at temperatures ranging from 100 to 275°C using the slow strain rate technique. A critical potential above which IGSCC occurs has been determined as a function of temperature and solution composition. The propagation of intergranular cracks can be arrested by changing the potential to values below the critical potential. Corrosion fatigue crack growth rates have been measured as a function of potential and loading frequency in sulfate solution at 250°C. At frequencies lower than 0.08 Hz a critical potential range has been determined above which the crack growth rates are greatly enhanced, corresponding to a change in the fracture mode from transgranular to intergranular. Finally, the effect of heat treatment time and temperature, as well as cold work prior to heat treatment, on the degree of sensitization of Type 304 stainless steel has been studied by using newly developed electrochemical methods. 40 refs., 39 figs.

39502 **(EUR—8817) First demonstration report on the high temperature materials data Bank of JRC.** (Commission of the European Communities, Petten (Netherlands). Joint Nuclear Research Center; Commission of the European Communities, Ispra (Italy). Joint Research Centre). 1983. 93p. NTIS (US Sales Only), PC A05/MF A01. File Number DE85701608.

The High Temperature Materials Programme of the Joint Research Centre has among its activities a project which has the objective to develop a computerised data bank containing mechanical property data of alloys for high temperature applications. The pilot phase of this project during the multiannual programme 1980-1983 is restricted to a few alloys and properties. The present scope comprises tensile, creep and fatigue test results with emphasis on 600-1000°C test temperature and C-O-H environments for alloys covered by the specifications of the "Alloy 800" group. The data bank is now operational. This report is the first presentation of the data bank characteristics, contents and some output illustrations. It contains a descriptive part on the system and its structure and on the characteristics and quantity of the present data, and an illustrative part showing examples of data bank processed output. The selected print-outs are generated by interactive on-line searches and subsequent numerical or graphical processing in the data bank facilities at Petten and Ispra which are linked by EURONET.

39503 **(EUR—9248) Materials division facilities and equipment.** Biest, O. v.d. (Commission of the European Communities, Petten (Netherlands). Joint Nuclear Research Center). 1984. 43p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701609.

The research activities of the Division at the Petten Establishment have the aims of characterising the properties of high temperature materials in industrial process environments and of understanding the structures involved in order to gain an insight into behavioural mechanisms. Metallic materials fall within the scope of the programme; the activities are, at present, almost entirely concerned with austenitic steels and nickel based alloys. Starting in 1984, advanced ceramic materials will be studied as well. The equipment available permits the study of mechanical properties in controlled gaseous environments, of the rates and mechanisms of corrosive reactions between materials and those environments, and of the surface and bulk structures by advanced physical techniques. Special preparation and treatment techniques are available. The Division has developed a Data Bank on high temperature alloys. It also operates an information Centre, the activities of which include the organisation of scientific meetings, the commissioning of "state of the art" studies on topics in the field of high temperature materials and their applications and the development of a inventory of current research activities in the field in Europe. This booklet is intended to present the facilities and services of the Division to the organizations which are interested in its programmes of work.

39504 **(IAE—3795/11) Formation of linear periodical structures of radiation defects in zirconium - 1% niobium alloy under fast neutron irradiation in WWR type reactors.** Gurovich, B.A.; Astrakhantsev, M.S.; Platonov, P.A.; Elesin, L.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1983. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701613.

Structural changes taking place under fast neutron irradiation in zirconium-1% niobium alloy (N-1 alloy) have been studied. Investigations have been conducted on tubular cans, a part of which has been subjected to internal pressure and plastic tensile deformation up to approximately 10% on irradiation in WWR type reactors. Irradiation temperature as a function of can section position along a reactor core height constituted 290-360 deg C. Fast neutron fluences acting upon can material constituted (0.3-6) x 10^{25} n/m^2, $E > 0.5$ MeV. Investigation structural changes has been conducted by the methods of transmission electron microscopy. It has been found out that formation of linear periodical structures of radiation defects is observed under definite conditions in the N-1 alloy. Data on the type of forming radiation defects, their sazese density, etc. have been presented.

39505 **(IAE—3802/16) CLUST-applied program package for solution of radiation problems in solid-state physics.** Sidorenko, A.D. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1983. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701751.

A general structure is outlined of the CLUST applied program package for a system of equations describing nucleation and growth of dislocation loops and vacancies in metal exposed to a fast particle flux. The CLUST package represents a set of programs for solving the systems of ordinary differential equations of special type with entering the count results into the file. The count process is controlled by a special monitor, which essentially facilitates the user program checkout and increases the efficiency of using computer time. The output of the results and scanning of the file can be realized through the analog-digital printing device or the terminal. The package structure enables the programs to be easily rearranged for solving other problems with the total number of variables 500. Operation with the package in the BEhSM-6 computer is described and principles of package rearrangement are presented. 8 references.

39506 **(IAE—3818/11) Radiation brittleness mechanisms in structural steels in the presence of gaseous impurities.** Kevorkyan, Yu.R.; Platonov, P.A.; Tursunov, I.E. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1983. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701614.

Manifestations of radiation brittleness of structural steels are considered from the viewpoint of common approach which is based on the grain boundary state variation resulted from appearance of microstructural peculiar features and their interaction with gaseous impurities accumulated in steels under service conditions. The hydrogen effect in the processes of intercrystalline corrosion and corrosion cracking is noted.

39507 **(IC—84/122) Augmented space formulation of the optical conductivity of random semiconducting alloys.** Mookerjee, A. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1984. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701616.

A formalism has been developed for the study of optical conductivity of disordered semiconducting alloys effect of off-diagonal disorder, clustering and randomness in the electron-photon interaction matrix may be incorporated within this. The aim is to finally study GaAssub(x)Sbsub(1-x) as well as deep levels in this alloy.

39508 **(IC—84/130) Phonon frequency shifts and the pressure dependence of Tsub(c) in lanthanum.** Asokamani, R.; Suvasini, M.B.; Rajagopalan, M.; Sundararajan, V. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1984. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701611.

We report the effect of pressure on phonon frequency and its influence on the superconducting transition temperature in the case of lanthanum. The variation of phonon frequency with pressure is calculated through the thermodynamic Grueneisen parameter γsub(G). Tsub(c) values calculated are found to agree very well with the experimental results.

39509 **(IC—84/142) Effect of pressure on the bandstructure and superconductivity in lutetium.** Asokamani, R.; Natarajan, S.; Rajagopalan, M.; Sundararajan, V.; Suvasini, M.B.; Iyakutti, K. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1984. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701612.

The detailed bandstructure and superconducting behaviour of lutetium at 230 kbar pressure is reported here. The electronic contribution eta to the electron-phonon mass enhancement lambda is studied within the rigid muffin-tin (RMT) approximation. The pd and df matrix elements are expressed in terms of 'd' bandwidth, Fermi energy and muffin-tin zero. The variations of Grueneisen parameter and Debye temperature with pressure are studied and applied in the calculation of Tsub(c). The calculated Tsub(c) value agrees fairly well with the experimental value. The changes in the conduction bandwidth and the electronic specific heat coefficient with pressure are found to be in agreement with theoretical prediction.

39510 (INIS-BR—279, pp 220) **Thermo luminescence and related phenomena in X-irradiated ionic crystals.** Inabe, K.; Takeuchi, N. (Kanazawa Univ., Japan). 1984. NTIS (US Sales Only), PC A10/MF A01. File Number DE85781265. (CONF-8408159—Vol.4).

From 4. Japan-Brazil symposium on science and technology; Rio de Janeiro;Sao Paulo, Brazil (6 Aug 1984).

Thermo luminescence (TL) is commonly observed in ionic crystals previously irradiated when they are warmed above room temperature. The results of experiments carried out to reveal the role of Cu^+ ions in the TL glow peaK of X-irradiated NaCl:Cu^+ crystals and the effects of aggregration of the divalent impurities doped in the crystals are described. The paper is also extended to the new technology of photoacoustic spectroscopy applied to the photo-stimulated luminescence in X-irradiated NaCl crystals. The luminescence center of the prominent glow peak of 327K in NaCl:Cu^+ is confirmed to be the excited state of the substitutional Cu^+ ions, that is, the 327K peak is attributed to the Cu^{2+} ions annihilated by the recombination with electrons thermally released from the F^- centers. A new characteristic decay behaviour of the glow peak is found in the main peak of 408K of X-irradiated KCl:Sr^{2+} crystal. It is suggested that the interstitials (hole trapped centers) formed by irradiation are responsible for the decay behaviour. A qualitative explanation of the result is obtained by using rate equations based on the reaction model assuming two types of the inter-

stitials with different decay constants depending on the degree of the aggregation of Sr^{2+} ions and cation vacancies. Non-radiative transition in the recombination luminescence of the X-irradiated NaCl crystals is investigated by using a new technique of the photoacoustic spectroscopy (PAS). The result indicates that the decrease of luminescence efficiency due to the doping of Ca^{2+} ions in $NaCl:Cu^{+}$ crystal is caused by the increase of the increase of the non-radiative transition in the relaxation process.

39511 (INIS-BR—279, pp 220) **Electron irradiation effect on single crystal of niobium.** Otero, M.P.; Lucki, G. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil). 1984. NTIS (US Sales Only), PC A10/MF A01. File Number DE85781265. (CONF-8408159—Vol.4).

From 4. Japan-Brazil symposium on science and technology; Rio de Janeiro;Sao Paulo, Brazil (6 Aug 1984).

The effect of electron irradiation (900 KeV) on gliding dislocations of single crystal Nb with its tensile axis in the [941] orientation was observed for the in-situ deformation in a high voltage electron microscope (HVEM) at Argonne National Laboratory. The experiment was carried out by the 1 hour-electron irradiation with no stress applied. Straight dislocations actuating as sinks for the electron produced defects became helicoidal as the irradiation proceeded. Frenkel pairs were created in Nb for electron energies > = 650 KeV and, as the single vacancies do not undergo long-range migration in Nb at temperatures much below 620 K, the defects that are entrapped by the dislocations are self-interstitials produced by electron displacement. Applying the stress it was possible to observe that modified dislocations did not glide while the dislocations not affected by the irradiation are visibly in movement. This important result explains the neutron and electron-irradiation induced work-hardening effect for Nb that was previously observed.

39512 (INIS-mf—9645, pp 8-9) **Metallurgical applications of x-ray microanalysis.** Wayman, M.L. (Alberta Univ., Edmonton (Canada). Dept. of Mineral Engineering). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).

From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).

Summary.

39513 (INIS-mf—9645, pp 22-23) **Sequential crystal lattice images of grain growth in amorphous germanium.** Parsons, J.R.; Hoelke, C.W. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).

From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).

Summary.

39514 (INIS-mf—9646, pp 56-57) **Ion beam thinning of a zirconium alloy for TEM.** Silva, E. (Chile Univ., Santiago. Dept. de Fisica); Robinson, J.W. (Windsor Univ., Ontario (Canada). Dept. of Engineering Materials); Northwood, D.O. 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

39515 (INIS-mf—9646, pp 58-59) **Zone axis pattern maps from zirconium monocrystals.** Silva, E.; Riquelme, J. (Chile Univ., Santiago. Dept. de Fisica); Robinson, J.W. (Windsor Univ., Ontario (Canada). Dept. of Engineering Materials). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

39516 (INIS-mf—9646, pp 14-15) **Radiation damage in crystalline materials as investigated using ion channeling and transmission electron microscopy.** Howe, L.M. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

39517 (INIS-mf—9646, pp 66-67) **Order-disorder transformation in CuPd induced by 14 MeV copper ion irradiation.** Zee, R.H. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.); Kulcinski, G.L. (Wisconsin Univ., Madison (USA)). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

39518 (INIS-mf—9646, pp 68-69) **Analysis of dislocation loops in HVEM irradiated zone refined zirconium and Zircaloy-4.** Herring, R.A.; Griffiths, M.; Loretto, M.H.; Smellman, R.E. (Birmingham Univ. (UK). Dept. of Physical Metallurgy and Science of Materials). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

39519 (INIS-mf—9646, pp 72-73) **Crystallography and defects in explosively crystallized amorphous germanium.** Parsons, J.R.; Hoelke, C.W. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

39520 (INIS-mf—9696) **Contributions to atomic microdynamics study in some liquid metals by means of soft neutrons scattering.** Rotarescu, G. (Institutul de Fizica si Inginerie Nucleara, Bucharest (Romania)). 1981. 19p. (In Romanian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701752.

Summary of a doctorate thesis.

Measurements of inelastic scattering of soft neutrons on Bi and liquid Pb, applying all the necessary corrections in view of obtaining the dYnamic structure factor $S(Q,\omega)$ were performed. The $F(Q,t)$ function of intermediate scattering was obtained by means of the Fourier transformation of $S(Q,\omega)$. Special attention was devoted to one multiple scattering correction, especially at small scattering angles, taking into account its influence on the results. A comparison of the experimental results with three recent theoretical models has shown a good agreement in the range of intermediate and high Q values. Measurements of neutron inelastic scattering on liquid sodium at a temperature of 233 Cdeg within a momentum transfer range of $1\ A^{-1} <= Q <= 2.2\ A^{-1}$ were performed. The scattering law $S(\alpha,\beta)$ that was compared to a series of theoretical models has been determined from the experimental data. The validity of the theoretical models for different ranges of energy and momenta was thoroughly checked. $S(\alpha,\beta)$ was calculated for each type of scattering since sodium proves a mixed, coherent and incoherent scattering agent. A study on the influence of the even interaction potential upon the $S(Q,\omega)$ dynamic structure factor, the fourth order momentum $\omega^4(Q)$ and uoon the spectral function $C(Q,\omega)$ of longitudinal current correlations was performed. For this purpose, four potentials with oscillations at great distances and a Lennard-Jones type potential were used.

39521 **(INPE—2811) Pb /sub 1-x/ Sn /sub x/ Te monocrystal growth by vapor phase transport, with formation of a liquid/solid growth interphase.** An, C.Y.; Bandeira, I.N. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). 1983. 7p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701711.

Due to segregation effects single-crystals of Pb /sub 1-x/ Sn /sub x/ Te growth by Bridgman techniques have an inhomogenous composition profile. A vapor phase transport growth process has been developed in order to reduce convective flows. This is due to the very thin melt layer in front of the crystal, that makes convective flows small and solute mixing in the melt very low. By this process single-crystals with 60 mm lenght by 15 mm diameter and a high degree of homogeneity have been grown.

39522 **(INPE—2813) Composition profile determination in isomorphous binary alloys.** An, C.Y.; Bandeira, I.N. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). Jul 1983. 8p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701712.

The inhomogeneity along the growth axis of the pseudobinary alloys is due to the segregation of the solute which will be mixed in the melt due to convective and diffusive flows. A process for determination of the exact composition profile by measurements of the crystal density, for alloys of the type A /sub 1-x/ B /sub x/, is shown.

39523 **(IS-M—538) Effects of microstructure on the acoustoelastic measurements of stress.** Thompson, R.B.; Smith, J.F.; Lee, S.S. (Ames Lab., IA (USA)). 1983. Contract W-7405-ENG-82. 9p. (CONF-8310394—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015518.

From AIME-ASM fall meeting; Philadelphia, PA, USA (1 Oct 1983).

The acoustoelastic measurement of stress is based on deformation induced shifts in the ultrasonic velocity. Although changes in stress are routinely monitored, the absolute determination of stress in a part of unknown history is rendered difficult by competing microstructurally induced velocity shifts. A number of techniques to overcome this problem are first reviewed. A more detailed discussion is then given of a potential solution under investigation by the authors. This involves measuring the difference in the velocities of two shear waves whose directions of propagation and polarization have been interchanged. According to the theory of anisotropic elastic continua, the proportionality constant relating this velocity difference to stress should be only weakly dependent on microstructure. Preliminary measurements show that this prediction is followed in mildly anisotropic (rolled 6061 Al) and plastically deformed (1100 Al loaded beyond yield) metal polycrystals. Included is a discussion of more severe microstructural conditions which must be considered to establish the ultimate limits of the technique.

39524 (IWGFR—49-Vol.1, pp 31-33) **Overview of European Community (Activity 3) work on materials properties of fast reactor structural materials.** Wood, D.S. (UKAEA Risley Nuclear Power Development Labs.); Terzaghi, A. (Commission of the European Communities, Brussels (Belgium)). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

The Fast Reactor Coordinating Committee set up in 1974 the Working Group Codes and Standards, and organized its work into four main activities: Manufacturing standards, Structural analysis, Materials and Classification of components. The main purpose of materials activity is to compare and contrast existing national specifications and associated properties relevant to structural materials in fast reactors. Funds are available on a yearly basis for tasks to be carried out through Study Contracts. At present about four Study Contract Reports are prepared each year.

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39525 (IWGFR—49-Vol.1, pp 35-65) **Survey on structural material investigations for SNR 300.** Grosser, E.D. (Internationale Atomreaktorbau G.m.b.H. (INTERATOM), Bergisch Gladbach (Germany, F.R.)); Gross, S. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)); Warmerdam, C.P. (TNO, Delft (Netherlands)). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

Type 304 SS in a modified, fully austenitic version has been used for the construction of the primary and secondary heat transfer system, including the vessel and the pumps; the steam generators were built of 2.25 Cr-1 Mo-Nb ferritic steel. Coordinated programs involving INTERATOM, KfK, ECN, TNO, CEN/Mol have been performed. The SNR-300 project related structural material activities have provided a broad base to describe materials properties behaviour and design limitations under aspects of long-term component reliability and availability. High temperature design needs have been covered by the development of constitutive relations and computational programs. Integrity considerations and deformation limits under hypothetical circumstances have been verified successfully. Investigations on alternative materials for permanent structure have been started.

39526 (IWGFR—49-Vol.1, pp 67-76) **Review of activities in France in the field of mechanical properties of structural materials.** Petrequin, P.; Felsen, M.F. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Technologie). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

The rapid overview of French programs in the field of mechanical properties of structural materials describes some of the more important results or programs in progress: Completion of the characterization of the 316 L SPH steel as well as weld metal under tensile, creep and fatigue conditions; further analysis for describing behaviour and damage accumulation on 316 L SPH under creep and fatigue; behaviour of primary circuit material under faulted conditions; further analysis of aging behaviour of 316 L SPH steel including fracture mechanics prediction for end of life conditions and sensitization phenomena; influence of low dose irradiation.

39527 (IWGFR—49-Vol.1, pp 77-91) **Overview of fast reactor structural materials programme in India.** Rodriguez, P.; Paranjpe, S.R.; Chetal, S.C.; Mannan, S.L.; Ray, S.K.; Seetharaman, V.; Srinivasan, G. (Reactor Research Centre, Kalpakkam (India)). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

The fast reactor structural materials activities in India comprise of the programme on the materials for the Fast Breeder Test Reactor (FBTR), the construction of which is nearing completion, and the programme on the candidate materials for the Prototype Fast Breeder Reactor (PFBR) which is now in the design stage. For the materials in use in FBTR, the main thrust has been towards detailed evaluation and documentation of long term (creep) properties of type 316 stainless steel base material in air. For the PFBR the philosophy has been to identify the candidate materials and to evolve a wider scope for the testing and evaluation programmes. The major structural component is identified as variants of type 304 stainless steel and the programmes undertaken include study of low cycle fatigue properties and environmental effects on creep and stress rupture properties. Evaluations of aging embrittlement of type 316 stainless steel base material and weldments are also in progress. The paper lists the testing programmes identified for adoption in the near future. These include creep-fatigue damage studies and fracture mechanics studies on weldments for type 304 stainless steel and testing programme on 2.25 Cr-1 Mo and 9 Cr-1 Mo steels, the identified candidate materials for steam generators.

The development efforts also include a comprehensive programme on inelastic analysis procedure.

39528 (IWGFR—49-Vol.1, pp 93-108) **Present status and future program on in-air FBR structural material tests.** Atsumo, H.; Yoshitoshi, A.; Nihei, I.; Kano, S.; Ebata, M.; Wada, Y. (Power Reactor and Nuclear Fuel Development Corp., Oarai, Ibaraki (Japan). Oarai Engineering Center). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

This paper describes the in-air structural material test program of the Power Reactor and Nuclear Fuel Development Corporation to support the project for development of a fast breeder reactor in Japan. Step I program continued 2-years since 1977. In this stage, tentative design allowable stresses were prepared for 'Monju'. Step II program continued 3-years since 1979. In this advance stage, tentative material strength standard on tensile, creep, relaxation and fatigue properties were proposed. Now, Step III program is performed. This is the final stage of the structural material test for the design of 'Monju'. Present status and future program is described in this paper, with test matrixes of Step I-II and test items of Step III.

39529 (IWGFR—49-Vol.1, pp 109-114) **Overview of the research programmes of the Commission of the European Communities Joint Research Centre in the field of LMFBR materials properties.** Larsson, L.H.; Piatti, G. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

The activity of the Commission of the European Communities (CEC) regarding the harmonization of codes and standards for the construction of LMFBR's is presented in a paper by D.S. WOOD and A. TERZAGHI. This paper presents the CEC's Joint Research Centre's research programme on LMFBR materials which concerns four areas: a) High temperature tensile properties. b) Investigations on creep/fatigue interaction in austenitic stainless steels. c) The measurement of dynamic materials properties taking into account the effects of irradiation and prior damage due to creep and fatigue. d) Work on fracture mechanics, mainly oriented on the measurement of fracture toughness and crack growth resistance curves of irradiated austenitic stainless steels. A general description of this work is given and the main conclusions drawn from the available results.

39530 (IWGFR—49-Vol.1, pp 115-136) **Overview of UK programme on mechanical properties of fast reactor structural materials.** Wood, D.S. (UKAEA Risley Nuclear Power Development Labs.). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

The UK programme has been devised to endorse the use of Type 316 steel and its associated weld metal in the primary circuit of a fast reactor. In relation to ferritic steels for the steam generator, most emphasis is being placed on 9%Cr1%Mo steel (thin and thick section), with attention also being given to 2.25%Cr1%Mo steel and a number of high strength 9%Cr steels. Baseline information is being obtained on material 'as received' condition but emphasis is also being given to service conditions which may influence the behaviour such as thermal aging, irradiation and sodium environments. The situation regarding and future work intentions on these steels for UK fast reactor applications is given.

39531 (IWGFR—49-Vol.1, pp 137-164) **Overview of U.S. LMFBR structural materials mechanical properties program.** Horak, J.A. (Materials and Structures Technology Management Center, Oak Ridge National Lab., TN (USA)); Purdy, C.M. (USDOE Assistant Secretary for Nuclear Energy, Washington, DC. Office of Breeder Technology Projects). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

This paper presents the objective, scope, and status of the U.S. Department of Energy's Materials and Structures Program to develop a data base on mechanical properties of structural materials for out-of-core structures and components for LMFBRs. Information on the development of a reference data base on materials for the reactor system, reactor enclosure system, primary heat transport system, intermediate heat transport system, and steam generator system is included. In addition, the development of the data and analyses to account for the effects of temperature and stress, as well as water/steam, sodium, and radiation environments, is described. Plans for the development of alternative materials for future out-of-core applications are presented.

39532 (IWGFR—49-Vol.1, pp 165-177) **Studies and choice of structural materials for NSSS of BN reactors.** Bykov, V.N.; Rineisky, A.A.; Starkov, O.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

Results of some studies on choosing and performance validation of structural materials for nuclear steam supply systems with fast reactors are presented. In particular the problem of materials has been considered for fuel elements and fuel assembly cans with account of radiation effects, as well as for sodium-water steam generators with account of their operating conditions.

39533 (IWGFR—49-Vol.1, pp 179-213) **Review of mechanical properties and microstructures of types 304 and 316 stainless steel after long-term aging.** Horak, J.A.; Sikka, V.K. (Metals and Ceramics Div., Oak Ridge National Lab., TN (USA)); Raske, D.T. (Argonne National Lab., IL (USA)). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

Because commercial liquid metal fast breeder reactors (LMFBRs) will be designed to last for 35 to 40 years, an understanding of the mechanical behavior of the structural alloys used is required for times of 2.2 to 2.5 x 10^5h (assuming a 70% availability factor). Types 304 and 316 stainless steel are used extensively in LMFBR systems. These alloys are in a metastable state when installed and evolve to a more stable state and, therefore, microstructure during plant operation. Correlations of microstructures and mechanical properties during aging under representative LMFBR temperature and loading conditions is desirable from the standpoint of assuring safe, reliable, and economic plant operation. We reviewed the mechanical properties and microstructures of types 304 and 316 stainless steel wrought alloys, welds, and castings after long-term aging in air to 9 x 10^4h (about 10-1/2 years). The principal effect of such aging is to reduce fracture toughness (as measured in Charpy impact tests) and tensile ductility. Examples are cited, however, where, because stable microstructures are achieved, these as well as strength-related properties can be expected to remain adequate for service life exposures.

39534 (IWGFR—49-Vol.1, pp 215-232) **Deformation behaviour of type 316 steel at 400 deg. C.** Wood, D.S.; Williamson, K. (UKAEA Risley Nuclear Power Development Labs.). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

A variety of type 316 steel deformation tests at 400 deg. C involving a study of strain rate, stress increment, stress cycling and strain cycling effects are reported. It is concluded that very small ratchet strains may occur, but these are unlikely to be of engineering significance. It is also shown that in the absence of reversed plasticity the upper stress bound is represented by the monotonic stress-strain curve. Under reversed plasticity, significant cyclic hardening can occur and in this case the upper bound may be represented by the cyclic stress-strain curve.

39535 (IWGFR—49-Vol.1, pp 233-247) **Influence of grain size on the tensile and creep properties of a type 316 stainless steel.** Mannan, S.L.; Samuel, K.G.; Rodriguez, P. (Reactor Research Centre, Kalpakkam (India)). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

The influence of grain size, on the tensile deformation behaviour in the temperature range 300-1223 K and on the creep rate at 873 and 973 K over a wide range of applied stresses, in a type 316 stainless steel has been investigated. For the tensile results, the Hall-Petch relation was found to be valid up to 1023 K. The variations of flow stress and work hardening rate with temperature and grain size have been found to be influenced by dynamic strain aging which occurs in the temperature range 523-923 K. The creep experiments revealed that grain boundaries contribute to strengthening at high stresses (180-260 MPa) at 873 K but this strengthening does not correlate with the available models which attempt to incorporate the Hall-Petch strengthening effect into creep rate equations. At 973 K the creep rate was generally constant but increased at small grain sizes and at lower stresses due to increased contribution from grain boundary sliding. The difference in the grain size effects on creep at the two temperatures is attributed to the difference in the substructures developed during creep.

39536 (IWGFR—49-Vol.1, pp 249-261) **Heat to heat variations in the creep rupture strength of a modified AISI 316 grade stainless steel.** Mathew, M.D.; Mannan, S.L.; Ray, S.K.; Rodriguez, P. (Reactor Research Centre, Kalpakkam (India)). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

A modified AISI 316 grade stainless steel has been used as the construction material for a large number of structural components for the Fast Breeder Test Reactor. The creep rupture properties of this material belonging to three different heats have been studied at temperatures of 823, 873 and 923 K in the stress range of 120 to 300 MPa for test durations up to 60,000 hours. Considerable variations in the creep rupture strength were observed from one heat to another, at all the three temperatures. The scaling of applied stress with the ultimate tensile strength at the corresponding temperatures, however, reduced the heat-to-heat variations to some extent. The heat-to-heat variations are attributed to differences in the amount of interstitial solutes in the steel as well as in grain size.

39537 (IWGFR—49-Vol.1, pp 263-295) **Stress rupture properties of austenitic steel weld metals.** Wood, D.S. (UKAEA Risley Nuclear Power Development Labs.). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

Elevated temperature stress rupture data on Mo containing and Mo free austenitic weld metals have been collected from French, Dutch, German and UK sources and the results analysed. The stress rupture strength of Mo containing weld metal is significantly higher than that of Mo free weld metal. At 10,000h the rupture strength of Mo containing weld metal is higher than that of Type 316 steel whereas the Mo free weld metal is about 20% lower than that of Type 304 steel. Austenitic weld metal can give low stress rupture ductility values. It is concluded that there are insufficient data to permit reliable extrapolations to long times and it is recommended that long term tests are performed to overcome this situation.

39538 (IWGFR—49-Vol.1, pp 297-326) **Low ductility creep failure in austenitic weld metals.** Thomas, R.G. (Central Electricity Generating Board, Barnwood (UK). Generation Development and Construction Div.). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

Creep tests have been carried out for times of up to approx. 22,000 hrs on three austenitic weld metals of nominal composition 17Cr-8Ni-2Mo, 19Cr-12Ni-3Mo+Nb and 17Cr-10Ni-2Mo. The two former deposits were designed to produce delta-ferrite contents in the range 3-9% while the latter was designed to be fully austenitic. The common feature of all three weld metals was that they all gave very low strains at failure, typically approx. 1%. The microstructures of the failed creep specimens have been studied using optical and electron microscopy and the precipitate structures related to the occurrence of low creep strains. Creep deformation and fracture mechanisms in austenitic materials in general have been reviewed and this has been used as a basis for discussion of the observations of the present work. Finally, some of the factors that can be controlled to improve long-term creep ductility have been appraised.

39539 (IWGFR—49-Vol.1, pp 327-349) **Low cycle fatigue studies on a type 304 stainless steel.** Bhanu Sankara Rao, K.; Valsan, M.; Sandhya, R.; Ray, S.K.; Rodriguez, P. (Reactor Research Centre, Kalpakkam (India)). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

The effects of temperature and strain rate on the low cycle fatigue behaviour were investigated for an AISI 304 stainless steel under total axial strain control mode at 823 and 923 K. The fatigue life was strongly dependent on cyclic deformation rate for this material at these temperatures, decreasing markedly with decreasing strain rate. The cyclic stress-strain response recorded in the form of hysterisis loops exhibited serrations at low strain rates at 823 and 923 K. Cyclic stress-strain response at 823 K has shown an increase in saturation stress and decrease in plastic strain range whereas there is an increase in plastic strain range without marked variation in saturation stress level at 923 K with decreasing strain rate. It has been observed that there are three simultaneous effects namely environment, creep and cyclic strain ageing which contribute to the observed degradation in fatigue life at low strain rates. At 823 K, where the creep damage as well as environmental damage is relatively small, the fatigue life is considered mainly to be affected by dynamic strain ageing effect which depends on strain rate. At 923 K, on the other hand, the strain rate dependence of fatigue life is considered to be determined by the combination of creep and environmental effects. Deformation and fracture studies have also confirmed that the wedge type crack propagation is accelerated by oxidation effect.

39540 (IWGFR—49-Vol.1, pp 351-385) **LCF behaviour of SS AISI 304 in the temperature range between 450 deg. C and 850 deg. C in connection with life time predictions.** Bocek, M.; Petersen, C.; Schmitt, R. (Kernforschungszentrum Karlsruhe, Institut fuer Material- and Festkoerperforschung 2 (Germany, F.R.)). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

The lifetime in high amplitude strain cycling with tensional hold periods is analysed presuming that creep failure damage is life determining. The life fraction rule (LFR) is used to calculate the lifetime consumpted during the dwell period in strain controlled tests as well as during tensional hold time stress cycles. It follows from the present investigation that stress relaxation occurring during the strain hold periods has a dominant influence upon the lifetime. The damage in stress relaxation is calculated by means of the LFR and the results are compared to experiments conducted on Zircaloy-4 (T=600 deg. C) and the austenitic stainless steel Type AISI 304 (T=650 deg. C). From the very good agreement between both it is concluded that under the loading conditions considered, creep failure damage is the main life determining damage contribution. To investigate the contributions of creep and fatigue to failure damage stress controlled experiments were conducted on AISI 304 at 550 deg. C and 850 deg. C. Whereas at the lower temperature ($T < 0.6$ Tsub(s)) for $R < 0$ the lifetime decreased with decreasing R-value (R = minimum load/maximum load) at the higher temperature ($T > 0.6$ Tsub(s)) the lifetime increased with decreasing R. Therefrom it is concluded that in the case considered for $T > 0.6$ Tsub(s) fatigue damage is not lifetime determining.

39541 (IWGFR—49-Vol.1, pp 387) **UKAEA creep/fatigue work on austenitic type 316 steel.** Wareing, J. (UKAEA Springfields Nuclear Power Development Labs.); Wood, D.S. (UKAEA Risley Nuclear Power Development Labs.). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

Published in summary form only.

39542 (IWGFR—49-Vol.1, pp 388-397) **Assessment of the linear damage summation method for creep-fatigue failure with reference to a cast of type 316 stainless steel tested at 570 deg. C.** Wareing, J.; Bretherton, I. (UKAEA Springfields Nuclear Power Development Labs.). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

This paper presents preliminary results from the programme for hold period tests on a cast BQ of type 316 stainless steel at 570 deg. C. The results of tensile hold period tests on a relatively low ductility cast of type 316 stainless steel have indicated that the failure mechanism changes from a creep-fatigue interaction failure to a creep dominated failure at low strain levels. An assessment of the linear damage summation approach for failure prediction indicates that it is inappropriate for creep-fatigue interaction failures. For creep dominated fracture, failure occurs when the accumulation relaxation strain exhausts the material ductility i.e. Nsub(f epsilon R)=D. The failure criterion based on a creep summation in terms of time to fracture underestimates life.

39543 (IWGFR—49-Vol.1, pp 398-409) **Analysis of the creep/fatigue behaviour of type 316 weld metal.** Wood, D.S.; Wynn, J. (UKAEA Risley Nuclear Power Development Labs.). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

The document presents creep/fatigue results obtained at UKAEA Risley Nuclear Labs. on type 316 weld metal and the associated stress rupture data and analyses them in the same way as that currently favoured for wrought material. The continuous cycling fatigue results are shown; the lower temperature is seen to give a higher endurance. The creep/fatigue results indicate that lower endurances are obtained at 625 deg. C and that with increasing hold time there is a tendency for the endurance to be lowered. The weld metal creep/fatigue endurances are compared with published UK data on wrought material for strain ranges of up to 3%. Under the conditions examined, it can be seen that the weld metal endurance is towards the top of the scatter band, the results at 550 deg. C forming the upper bound. The stress rupture data note that the ductility is reasonable at short times but fall to relatively low values at long times (10,000h).

39544 (IWGFR—49-Vol.1, pp 411-433) **Some observations on the relationship between microstructures, fatigue and creep behaviours in a type 316 stainless steel.** Horton, C.A.P.; Lai, J.K.L.; Skelton, R.P. (Central Electricity Research Labs., Leatherhead (UK). Materials Div.). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

Comparisons have been made between microstructures in Type 316 steel after high strain fatigue or creep at 625 deg. C and which had been subjected to various pre-test ageing treatments. The microstructures observed in the specimens generally consisted of a three dimensional dislocation network together with 'cells' delineated by dislocation sub-boundaries. In fatigue, under strain control conditions, pre-ageing reduced the dislocation density and coarsened the cell structure produced during test. This was related to less solute hardening and strain induced precipitation after pre-ageing and was accompanied by a lower rate of cyclic strain hardening. During fatigue with dwell, the dislocations introduced led to five times more precipitation than that observed during stress free ageing solution treated material. The 'cell' structure produced by fatigue was retained even after solution treatment at 1050 deg. C. In creep, under constant loads, a coarser and more clearly defined dislocation sub-grain structure developed and its size was not influenced by pre-ageing. However, creep testing after various pre-treatments, including fatigue, demonstrated that the creep resistance was dependent on a combination of solution strengthening, cell size and dislocation density. Consequently prior fatigue considerably increased the creep resistance. The work has demonstrated the microstructural aspects of creep-fatigue interaction and that the use of creep data obtained from solution treated material is likely to lead to errors in creep-fatigue life fraction summations.

39545 (IWGFR—49-Vol.1, pp 435-452) **Preliminary results of constant stress creep/fatigue tests on type 316 steel at 625 deg. C.** Wood, D.S.; Connaughton, M.D. (UKAEA Risley Nuclear Power Development Labs.). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

Some exploratory constant stress creep/fatigue tests have been performed to evaluate the material behaviour relative to that shown in the more conventional constant strain type of creep/fatigue test. No significant differences in endurance or fracture behaviour could be detected between the two types of test. It was found however that the constant stress type of creep/fatigue test gave higher cumulative creep strain values at failure and gave deformation that could be more readily correlated with the monotonic creep and rupture behaviour.

39546 (IWGFR—49-Vol.1, pp 453) **Design considerations of short crack surface defects in AISI 316 stainless steel.** Marshall, P.; Hellen, R.; Hooper, A.J.; Cordwell, J.E.; Whittingham, A.C. (Central Electricity Generating Board, Berkeley (UK). Berkeley Nuclear Labs.). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280. (CONF-8310198—Vol.1).

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

Published in summary form only.

39547 **(IWGFR—49-Vol.1) Specialist meeting on mechanical properties of structural materials including environmental effects, Chester, England, 10-14 October 1983.** (International Atomic Energy Agency, Vienna (Austria). International Working Group on Fast Reactors). 1983. 456p. (CONF-8310198—Vol.1). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781280.

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

Individual items in scope for the energy base were processed separately. (DLC)

39548 **(JAERI-M—84-080) High temperature alloys and ceramic heat exchanger.** Okamoto, Masaharu. (Japan Atomic Energy Research Inst., Tokyo). Apr 1984. 47p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701610.

From the standpoint of energy saving, the future operating temperatures of process heat and gas turbine plants will become higher. For this purpose, ceramics is the most promising candidate material in strength for application to high-temperature heat exchangers. This report deals with a servey of characteristics of several high-temperature metallic materials and ceramics as temperature-resistant materials; including a servey of the state-of-the-art of ceramic heat exchanger technologies developed outside of Japan, and a study of their application to the intermediate heat exchanger of VHTR (a very-high-temperature gas-cooled reactor).

39549 **(LA-UR—85-1135) Mechanical threshold of dynamically deformed copper and Nitronic 40.** Follansbee, P.S.; Kocks, U.F.; Regazzoni, G. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 11p. (CONF-850946—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE85010779.

From International conference on mechanical and physical behaviour of materials under dynamic loading; Paris, France (2 Sep 1985).

Measurements of the mechanical threshold, or threshold stress, are reported on quasi-statically and dynamically deformed copper and Nitronic 40. Results for copper show that the increase of the threshold stress with strain rate is similar to that of the flow stress. In Nitronic 40 the results show that the ratio of the flow stress to the threshold stress is ~0.6. Both results indicate that the increased rate sensitivity found in these materials at high strain rates is not due to the predominance of a viscous drag deformation mechanism, as has been previously suggested.

39550 (LA-UR—85-2251) Threshold stress measurements in shock-deformed copper. Follansbee, P.S.; Gray, G.T. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 19p. (CONF-850736—11). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014076.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

The height and shape of the obstacle profile for the dominant obstacle provide information on the nature of the deformed microstructure. These quantities can be measured on recovered shock-deformed material. Purpose of this paper is to investigate shock wave deformation mechanisms by measuring the mechanical threshold, or threshold stress, on shock deformed material. Oxygen-free-electronic (OFE) copper was selected for this study since its shock-deformation behavior has been extensively studied and since these shock-deformation results complement extensive measurements at strain rates up to $10^4\ s^{-1}$. Measurements of the mechanical threshold, their implications regarding deformation mechanisms and correlations with the microstructure characterized with TEM are described in this paper.

39551 (MB—4/82) Vanadium. A mineral commodity review. Duke, V.W.A. (Department of Mineral and Energy Affairs, Johannesburg (South Africa). Minerals Bureau). Jul 1983. 261p. NTIS (US Sales Only), PC A12/MF A01. File Number DE85781079.

Although a relatively abundant element, vanadium occurs only rarely in sufficient concentration to be worked commercially. In most cases, vanadium is produced as a co-product of some other element, most commonly iron. The principal ore deposits of vanadium occur in titaniferous magnetites that have been formed by magnetic segregation. Important commercial deposits of vanadium also occur associated with uranium, and with phosphate deposits. The principal uses of vanadium are in the production of special purpose, particularly high-strength low-alloy steels, in the manufacture of titanium alloys, and as a catalyst, notably in the manufacture of sulphuric acid. Small quantities of vanadium, often in combination with niobium, are added to steel to bring about toughening through grain refinement, and increased tensile strength through precipitation hardening. Known world reserves of vanadium are very large and fully adequate to meet any foreseeable demand. By far the largest known deposits of vanadium occur in South Africa. Many other similar deposits are known, but are only exploited in the USSR and China. The present total world demand for vanadium amounts to about 40 000 tons of metal annually and this is produced primarily in four countries, South Africa, the USSR, the People's Republic of China and the United States of America, in that order. South Africa is the principal vanadium producing country in the world, supplying vanadium in various forms. Vanadium has a very low and non-accumulative toxicity; recovery plants can be operated in such a manner to ensure no air or steam pollution results.

39552 (N—85-21320) Effect of reduction of strategic Columbium addition in 718 Alloy on the structure and properties. Final report. Ziegler, K.R.; Wallace, J.F. (Case Western Reserve Univ., Cleveland, OH (USA)). Jan 1985. 179p. (NASA-CR—174841). NTIS, PC A09/MF A01.

A series of alloys was developed having a base composition similar to Inconel 718, with reduced Cb levels of 3.00 and 1.10 wt% Cb. Substitutions of 3.0% W, 3.0W + 0.9V or Mo increased from 3.0% to 5.8% were made for the Cb in these alloys. Two additional alloys, one containing 3.49% Cb and 1.10% Ti and another containing 3.89% Cb and 1.29% Ti were also studied. Tensile properties at rooom and elevated temperatures, stress-rupture tests, and an analysis of extracted phases were carried out for each of the alloys. Additions of solid solution elements to a reduced Cb alloy had no significant effect on the properties of the alloys under either process condition. The solution and age alloys with substitutions of 1.27% i at 3.89% Cb had tensile properties similar top hose of the original alloy and stress-rupture properties superior to the original alloy. The improved stress-rupture properties were the result of significant precipitation of Ni3Ti-gamma prime in the alloy, which is more stable than gamma at the elevated temperatures. At lower temperatures, the new alloy benefits from gamma strengthening. With more precise control and proper processing, the reduced Cb direct-age alloy could substitute for Alloy 718 in high strength applications.

39553 (NEL—693) Effect of hydrostatic pressure on the tensile properties of alpha uranium. Chandler, E.F. (National Engineering Lab., East Kilbride (UK)). Sep 1984. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781080.

This report examines the effect of a superimposed hydrostatic pressure on the tensile properties of four grades of rolled unalloyed alpha uranium. The materials varied in carbon content and heat treatment. The principal effect of increasing pressure is an increase in the ductility of the materials. By not heat treating the uranium after the rolling process, the interaction of carbon content on mechanical properties is almost nullified.

39554 (PB—85-176543/XAB) Study of the corrosion of superalloys protected by coatings: role of impurities and stresses). Final report, 1 October 1984-1 October 1985. Abderrazik, G.B.; Moulin, G.; Boumaza, A.; Huntz, A.M. (Paris-11 Univ., 91 - Orsay (France)). 1985. 75p. (In French). NTIS, PC E04/MF E04.

Sponsored by Centre de Documentation de l'Armement, Paris (France). Direction des Recherches, Etudes et Techniques.

The authors researched the behavior of substrates (IN100 and CMSX2) covered with a plasma-sprayed NiCo23Cr19.5Al8.5Y0.6Ta4 coating. They found essentially that: (a) both duplex systems offered a good resistance to high-temperature corrosion, due in part to the presence of yttrium in the coating; (b) yttrium probably enhances the adhesion of oxide layers; (c) preliminary heat treatments will improve the corrosion resistance of these systems; (d) minor additions of elements such as titanium or tantalum contribute to corrosion resistance; (e) the roughness of the coating surface resulting from plasma spraying certainly has an effect on corrosion resistance. The authors are planning further research on the behavior of these systems when subjected to thermal cycling in a corrosive atmosphere and on the behavior of other systems of the same type.

39555 (PB—85-192250/XAB) Experimental studies of the geometric and electronic structure of chemisorption bonding. Annual report, January-December 1984. Plummer, E.W.; Gustafsson, T. (Pennsylvania Univ., Philadelphia (USA). Dept. of Physics). Mar 1985. 19p. NTIS, PC A02/MF A01.

The chemisorption of small molecules on carefully prepared alloy surfaces was studied using angle-integrated and angle-resolved photoelectron spectroscopy, as well as with more conventional surface techniques such as thermal desorption, low-energy electron diffraction, and work-function change. The authors studied the (110) face of the alloy NiAl, since it is the lowest index face with equal concentration of Ni and Al atoms. Simply stated, the objective is to separate or correlate the electronic and geometric factors governing chemisorption on bimetallic systems as a first step towards understanding the selectivity of multi-component catalysts. The chemisorption properties of the NiAl surface are fascinating. The ultimate objective is to tailor make or design catalysts with improved activity, selectivity, and lifetime for important gas technology such as methanation, combustion, fuel-cell electrochemistry, and methane-reaction chemistry. The final phase of this project will complete the study of the NiAl alloy surface.

39556 **(PUC-TN—20/82) Renormalization group treatment for the electronic spectrum of partially ordered one-dimensional alloys.** Koiller, B.; Davidovich, M.A.; Robbins, M.O.; Silva, C.E.T.G. da. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1982. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701718.

A new approach is presented for the calculation of the local density of electronic states in partially ordered binary chains. The method is based on recursion relations for renormalized tight-binding Hamiltonian parameters. Diagonal, off-diagonal and environmental disorder are easily incorporated for all degrees of short-range order. The method takes into account compositional fluctuations of arbitrary range; the states are found to be localized and the calculated densities of states are richly structure. The only approximation is the configurational averaging over species at decimated sites. The method is computationally very simple, and gives an interpolation scheme for all concentrations and degrees of short-range order, becoming exact in the ordered and dilute limits. These results are compared with published numerical data, and schemes for improvement are discussed.

39557 **(SAND—85-0156C) Stress and strain-rate dependence of spall strength in two aluminum alloys.** Ek, D.R.; Asay, J.R. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 6p. (CONF-850736—41). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015154.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

The spallation behavior of 6061-T6 and AMg-6 aluminum alloys was studied as a function of loading stress and initial pulse duration for stress amplitudes ranging from 5 to 20 GPa and for pulse durations spanning the range of 0.06 to 0.9 μs. These experiments show that the spallation strength varies from about 0.7 to 1.4 GPa for strain rates varying from 0.15 to 1 μs^{-1} and for impact stresses from 5 to 20 GPa.

39558 **(SAND—85-0233C) Steady-wave risetime and spall measurements on uranium (3-15 GPA).** Grady, D.E. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 24p. (CONF-850889—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015163.

From International conference on metallurgical applications of shock wave and high-strain rate phenomena; Portland, OR, USA (28 Jul 1985).

Planar impact experiments using thin discs of z-cut crystalline sapphire as impactors on samples of unalloyed uranium (D-38) have been performed over the pressure range of elastic response of the sapphire. The time-resolved motion of the uranium back free surface, due to the emerging shock wave, was monitored with laser velocity interferometry (VISAR). The propagation distance in most of the tests was sufficient to achieve a steady-wave plastic shock, and fast sweeping oscilloscopes were focused strictly on the rapidly-rising plastic wave. Impactor and sample thicknesses were selected to achieve spall within the uranium, and the spall signals were also measured. Risetime measurements indicate that the maximum strain rate in the plastic shock wave increases with the Hugoniot pressure, tending to a fourth power dependence at higher amplitudes, consistent with similar measurements on other metals. The spall strength determined from the pull-back signal ranges from 2.6 to 3.3 GPa and increases with increasing shock amplitude. Magnitude and rate dependence of the latter are consistent with a prediction of spall strength based on the material fracture toughness.

39559 **(SAND—85-0366C) Chemical synthesis under shock compression.** Graham, R.A.; Morosin, B.; Horie, Y.; Venturini, E.L.; Boslough, M.; Carr, M.J.; Williamson, D.L. (Sandia National Labs., Albuquerque, NM (USA); North Carolina State Univ., Raleigh (USA); Colorado School of Mines, Golden (USA)). 1985. Contract AC04-76DP00789. 19p. (CONF-850736—39). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015166.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

Many reports of chemical synthesis under high pressure shock loading have been published over the past thirty years, but little progress has been made in developing an understanding of the mechanisms responsible for the observed effects. This paper discusses the current status of studies in shock-induced solid state chemistry. It is observed that it is relatively easy to initiate and control chemical reactions in shock-loaded powder materials. In solids it is well known that chemical changes are controlled by defects at all levels from atomic and microstructural to continuum. A major program to study shock-induced modification of inorganic powders provides explicit evidence for unusually large plastic deformation and resulting defect structures. Shock-modified powders also show major enhancements in solid state reactivity in post-shock experiments. Currently, two systems are found to provide a basis for studying controlled chemical synthesis. Intermetallic alloys have been found to be produced in a controlled manner from mechanical mixtures of aluminum with either nickel or titanium. Optical measurements show that a strong chemical reaction is induced on a 100 nanosecond time scale in such aluminum-nickel mixtures under shock compression. The nonferrous metal oxide-ferric oxide system is another promising chemical system in which mixtures of zinc oxide and ferric oxide readily form a zinc-deficient zinc ferrite. Shock-induced chemical synthesis appears to provide a significant opportunity for the synthesis of new materials. Study of chemical effects associated with shock loading provides a new probe of shock-compression processes and current descriptions of the conditions under which they can occur suggest that chemical effects may be ubiquitous in fully dense materials encountered in shock compression studies. 45 refs., 6 figs., 1 tab.

39560 **(SAND—85-0484C) Shock-wave synthesis of titanium aluminides.** Horie, Y.; Hoy, D.E.P.; Simonsen, I.; Graham, R.A.; Morosin, B. (North Carolina State Univ., Raleigh (USA); Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 7p. (CONF-850736—33). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015140.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

The initiation of strong chemical reactions in a mixture of Ti and Al powders subject to high pressure shock-wave loading was observed when the bulk peak temperature of the region calculated from numerical simulation was above 450°C. A high temperature with a high pressure (above 15 GPa) does not promote reactions with significant yield. A reaction product (or products) has hardness twice the values for Ti-rich equilibrium compounds in the Ti-Al system. There was lack of agreement between x-ray analysis and EPMA regarding the composition of the products. X-ray diffraction showed the pattern for $TiAl_3$ or its two ordered superstructures while EPMA favored Ti-rich compounds-Ti_3Al, Ti_2Al and TiAl.

39561 **(SAND—85-0635C) Strain rate dependence in steady, plastic shock waves.** Dunn, J.E.; Grady, D.E. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 7p. (CONF-850736—20). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014703.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

The shock wave profile data of Barker for Al fits the empirical equation ϵ/sub m/ = kp/sub D/^{4} (ϵ/sub m/ = max abs strain rate in plastic wave, P/sub D/ = impact pressure). This note is a brief summary of further attempts to understand the constitutive implications of the above equation for the broader class of materials. (DLC)

39562 **(SAND—85-0850) Compatibility of refractory metals with sodium in the presence of oxygen and UO_2.** Zanner, F.J.; Hammetter, W.F.; Gronager, J.E.; Averill, W.A.; Feber, R.C. (Sandia National Labs., Albuquerque, NM (USA); Los Alamos National Lab., NM (USA)). Apr 1985. Contract AC04-76DP00789. 258p. NTIS, PC A12/MF A01; GPO Dep. File Number DE85016030.

Compatibility of Ta-10W, Ta-8W-2Hf, Mo, Mo-13Re, Mo-26Re, Mo-41Re, TZM, Re, and Re-5W alloys with Na and UO_2 were studied in two temperature regimes. In the first regime Yates order experiments with three independent variables $300 \geq T \leq 800°C$, $10 \geq t \leq 130$ hours, and $2 \geq [0] \leq 100$ ppmw oxygen potentials in Na were used to evaluate responses such as ultimate tensile strength, fracture energy, weight gain, and hardness. Samples were exposed to Na in individual crucibles with a fixed amount of oxygen. In the second regime, $\sim 600 \leq T \leq 2000°C$, tubes fabricated from the refractory alloys were loaded with UO_2 and Na containing 400 ppmw [0]. The bottom of the tube was heated to 2000°C and the top was allowed to cool naturally. A reflux condition was created in the tube and gradients approaching 250°C/cm were obtained on the walls of the tube. All of the materials were found to be compatible with Na in the low temperature regime and Ta-10W, Ta-8W-2Hf, and Mo-41Re were found to be compatible in the high temperature regime. Re and Re-5W exhibited grain boundary failure when subjected to the high temperature test conditions. Re additions were found to enhance the tensile properties of Mo but did not significantly improve the fracture toughness as inferred from the fractography. The mechanical properties of the Ta alloys were found to be very sensitive to the impurities in the Na. Fracture initiation was found to control the tensile ductility and fracture energy (defined as the area under the load-displacement curve of the tensile test divided by the original area at the root of the notches) of the Mo, Mo-Re, and Re alloys.

39563 **(SAND—85-1597C) Shock consolidation of IN-100 nickel-base superalloy powder.** Wang, S.L.; Meyers, M.A.; Graham, R.A. (New Mexico Inst. of Mining and Technology, Socorro (USA); Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 5p. (CONF-850736—36). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015159.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

Shock consolidation of IN-100 powders was studied in Sandia Bear and Bertha fixtures over a pressure from 7.5 to 27 GPa. In addition, the influence of pulse duration from 4.5 to 10 μs was investigated at 16 GPa. From the metallographic observations it was established that: (a) the mean pressure for strong bonding, with ~5% interparticle melting, is about 20 GPa; (b) the pulse duration seems to play a role in the consolidation; and (c) the shock temperature is an important parameter. It significantly enhances interparticle melting. 6 refs., 6 figs., 1 tab.

39564 **(UCRL—90817) Surface properties of shocked lead.** Couch, R.; Shaw, L.; Barlett, R.; Steinmetz, L.; Behrendt, W.; Firpo, C. (Lawrence Livermore National Lab., CA (USA)). Mar 1985. Contract W-7405-ENG-48. 11p. (CONF-850946—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85009582.

From International conference on mechanical and physical behaviour of materials under dynamic loading; Paris, France (2 Sep 1985).

Hydrodynamic experiments often require optical observation of shocked surfaces. However, phenomena that alter surface appearance can obscure the interpretation of data. We have extended our studies of material ejection to include more complicated shock structures. In addition, we have used both thin foils and an imposed atmosphere as ways of sampling the surface in search for nonhomogeneous behavior. Quantitative measures of mass ejection were obtained using x-ray transmission analysis, and high-speed photography provided qualitative data. Results indicate that the amount of mass ejected is a function of shock structure. Many heterogeneous effects are observed that are presumed to be related to surface preparation, partial melting, and spall.

39565 **(UCRL—91242) Failure criteria used in a probabilistic fracture mechanics code.** Lo, T.Y. (Lawrence Livermore National Lab., CA (USA)). 1985. Contract W-7405-ENG-48. 8p. (CONF-850809—12). NTIS, PC A02/MF A01; GPO Dep. File Number DE85007264.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

Two criteria are implemented in a piping reliability analysis code to assess the stability of crack growth in pipes. One is the critical net section stress criterion. It is simple and convenient but its application is limited to very ductile materials. The other is the tearing modulus stability criterion. This criterion has a solid technical base. However, calculating the J-integral, J, and the associated tearing modulus, T, usually requires a complicated finite element method (FEM). In this piping reliability code, existing J and T solutions in tabular or formula form instead of the FEM are used for computational efficiency. These two failure criteria are discussed and compared in terms of their effects on the estimation of pipe failure probability. 5 refs., 9 figs.

39566 **(UCRL—92286) Properties of niobium recovered from megabar dynamic pressures.** Nellis, W.J.; Moss, W.C.; Radousky, H.B.; Mitchell, A.C.; Summers, L.T.; Dalder, E.N.; Maple, M.B.; McElfresh, M. (Lawrence Livermore National Lab., CA (USA); California Univ., San Diego, La Jolla (USA)). Jun 1985. Contract AS03-76ER70227;W-7405-ENG-48. 8p. (CONF-850736—44). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015394.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

Nb was processed and recovered intact from peak dynamic pressures in the range 0.6 to 1.2 Mbar. Pressure and effective-plastic-strain histories were calculated using a finite-element hydrodynamic computer code. Recovered specimens were characterized by x-ray diffraction, metallography, Vicker's hardness, and superconducting transition temperature T/sub c/. The maximum change observed in the T/sub c/ of 9.18°K for the unshocked specimen was a decrease of 0.035°K in the specimen shocked to a maximum pressure of 0.6 Mbar. Shock processing of V_3Si at 1 Mbar was recently reported by Stewart et al. to depress T/sub c/ 1.8°K from the initial value of 16.4°K. These results indicate that shock-induced defects and disorder have a relatively weak effect on the T/sub c/ of equilibrium phases and suggest that shock-synthesized metastable superconductors might have T/sub c/'s close to intrinsic values for the ordered material.

39567 **(UCRL—92759) Hydrostatic extrusion of amorphous $Fe_{82}B_{12}Si_6$ and $U_{70}Cr_{30}$.** Lakner, J.F.; Cline, C. (Lawrence Livermore National Lab., CA (USA)). 25 Jun 1985. Contract W-7405-ENG-48. 11p. (CONF-850759—5). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014801.

From 10. high pressure conference on research in high pressure science and technology; Amsterdam, Netherlands (8 Jul 1985).

An investigation of the feasibility of forming dense cylinders from amorphous $Fe_{82}B_{12}Si_6$ and $U_{70}Cr_{30}$ platelets using a combination of die compaction and hydrostatic extrusion is described. Densities of up to 84% and 87% of theoretical were realized in one pass using an extrusion ratio of 1.6 for the iron and uranium alloys, respectively. Equations are presented for consolidation and extrusion parameters.

39568 **New technique for excitation of bulk and surface spin waves in ferromagnets.** Bogacz, S.A.; Ketterson, J.B. (Materials Science and Technology Division, Argonne National Laboratory, Argonne, Illinois 60439 and Department of Physics and Materials Research Center, Northwestern University, Evanston, Illinois 60201). *Journal of Applied Physics;* **58**: No. 5, 1935-1942(1 Sep 1985).

A meander-line magnetic transducer is discussed in the context of bulk and surface spin-wave generation in ferromagnets. The magnetic field created by the transducer was calculated in closed analytic form for this model. The linear response of the ferromagnet to the inhomogenous surface disturbance of arbitrary ω and k was obtained as a self-consistent solution to the Bloch equation of motion and the Maxwell equations, subject to appropriate boundary condition. In particular, the energy flux through the boundary displays a sharp resonantlike absorption maximum concentrated at the frequency of the magnetostatic Damon—Eshbach (DE) surface mode; furthermore, the energy transfer spectrum is cut off abruptly below the threshold frequency of the bulk spin waves. The application of the meander line to the spin diffusion problem in NMR is also discussed.

39569 Experimental and theoretical investigations of Cr(001) surface electronic structure. Klebanoff, L.E.; Victora, R.H.; Falicov, L.M.; Shirley, D.A. (Materials and Molecular Research Division, Lawrence Berkeley Laboratory, Berkeley, California 94720 and Departments of Chemistry and Physics, University of California, Berkeley, California 94720). *Physical Review [Section] B: Condensed Matter;* **32**: No. 4, 1997-2005(15 Aug 1985).

The surface electronic structure of Cr(001) is characterized by angle-resolved photoelectron spectroscopy. The spectral properties of surface-related photoemission features are found to be consistent with results from a comprehensive spin-polarized calculation of the Cr(001) surface electronic structure. The theory predicts the existence of a ferromagnetic Cr(001) surface phase characterized by a very large (3.00 electrons) surface spin polarization. The overall agreement between theory and experiment provides additional evidence that the Cr(001) surface is, in fact, ferromagnetic.

39570 Extended x-ray-absorption fine-structure Einstein frequency and moments of the phonon spectrum: An experimental and theoretical study. Knapp, G.S.; Pan, H.K.; Tranquada, J.M. (Materials Science and Technology Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review [Section] B: Condensed Matter;* **32**: No. 4, 2006-2009(15 Aug 1985).

Extended x-ray-absorption fine-structure measurements of the nearest-neighbor mean-square relative displacements (MSRD) for the fcc materials Ni, Cu, Yb, Pt, Au, Pb, and Th are presented. It is shown experimentally that the temperature dependence of the MSRD is well characterized by a single parameter ω/sub E/, the Einstein frequency. This frequency was found to be equal to the square root of the second moment of the phonon density of states $<\omega^3>$/sup 1/2/ in all cases studied. Theoretical calculations are presented which show that if nearest-neighbor interactions dominate, ω/sub E/ should equal $<\omega^3>$/sup 1/2/ to within 5%.

39571 Metal film deposition by gas-phase laser pyrolysis of nickel tetracarbonyl. Jervis, T.R. (Materials Science and Technology Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Applied Physics;* **58**: No. 3, 1400-1401(1 Aug 1985).

A new technique for the deposition of nickel metal films by gas-phase pyrolysis of nickel tetracarbonyl gas is described. A pulsed CO_2 laser is used to form a reaction zone adjacent to a cold substrate, resulting in a rapidly quenched film. The technique relies on dielectric breakdown of a mixture of source and carrier gases and therefore lends itself to a variety of source gases and chemistries. Adherence data and compositional and structural analyses are presented.

39572 Temperature dependence of the magnetic excitations in gadolinium. Cable, J.W.; Nicklow, R.M.; Wakabayashi, N. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831). *Physical Review [Section] B: Condensed Matter;* **32**: No. 3, 1710-1719(1 Aug 1985).

The magnetic excitation spectra of Gd were measured out to the zone boundaries in the <h00> and <00l> directions over the temperature range from 9 to 320 K. The <h00> data were not analyzed because of technical complications, but the <00l> data are described remarkably well over the entire q and T range of the experiments by a damped-harmonic-oscillator form for the spectral weight function. The <00l> data were parametrized and placed on an absolute basis by an internal calibration using the energy-integrated intensities of the low-temperature spin waves. This parametrization and calibration of the data provide a description of both the static and dynamic spin correlations over this temperature range. Spin-wave peaks are not observed above T/sub c/ in the <00l> direction. We attribute this result to the low spin-excitation energies relative to k/sub B/T/sub c/ in this direction.

39573 Proposed determination of many-body effects in heavy-fermion systems by conduction-electron-spin resonance. Bedell, K.S.; Meltzer, D.E. (Department of Physics, State University of New York at Stony Brook, Stony Brook, New York 11794). *Physical Review [Section] B: Condensed Matter;* **32**: No. 3, 1835-1838(1 Aug 1985). Contract AC02-76ER13001.

We propose that it might be possible to determine the contribution of many-body interactions to the large effective mass in "heavy-fermion" materials, e.g., UPt_3, by the method of conduction-electron-spin resonance (CESR). A microwave transmission observation of CESR may show a resonance pattern which, based on already measured parameters, would clearly distinguish among suggested models.

39574 Magnetic x-ray scattering studies of holmium using synchro- tron radiation. Gibbs, D.; Moncton, D.E.; D'Amico, K.L.; Bohr, J.; Grier, B.H. (Department of Physics, Brookhaven National Laboratory, Upton, New York 11973). *Physical Review Letters;* **55**: No. 2, 234-237(8 Jul 1985). Contract AC02-76CH00016.

We present the results of magnetic x-ray scattering experiments on the rare-earth metal holmium using synchrotron radiation. Direct high-resolution measurements of the nominally incommensurate magnetic satellite reflections reveal new lock-in behavior which we explain within a simple spin-discommensuration model. As a result of magnetoelastic coupling, the spin-discommensuration array produces additional x-ray diffraction satellites. Their observation further substantiates the model and demonstrates additional advantages of synchrotron radiation for magnetic-structure studies.

39575 Coexistence of ordered magnetism and superconductivity in Pd_2YbSn. Kierstead, H.A.; Dunlap, B.D.; Malik, S.K.; Umarji, A.M.; Shenoy, A.G.K. (Materials Science and Technology Division, Argonne National Laboratory, Argonne Illinois 60439). *Physical Review [Section] B: Condensed Matter;* **32**: No. 1, 135-138(1 Jul 1985). Contract W-31-109-ENG-38.

The magnetic and superconducting properties of the Heusler alloy Pd_2YbSn have been investigated with heat-capacity, resistivity, and magnetic-susceptibility measurements. The material undergoes a superconducting transition at 2.46 K and a magnetic transition at 0.23 K. The absence of reentrant behavior shows that the magnetically ordered state is coexistent with the superconductivity. A combined analysis of all the data gives the cubic crystalline electric-field parameters W = -12 K and x = -0.65, implying that the ground state of the Yb^{3+} ion in Pd_2YbSn is a Γ_7 magnetic doublet.

39576 Comment on "Transition-temperature oscillations in thin superconducting films". Paskin, A.; Strongin, M. (Department of Physics, Queens College of the City University of New York, Flushing, New York 11367). *Physical Review Letters;* **55**: No. 1, 139-139(1 Jul 1985). Contract AC02-76CH00016.

A Comment on the Letter by B. G. Orr, H. M. Jaeger, and A. M. Goldman, Phys. Rev. Lett. 53, 2046 (1984).

39577 Resistance measurements and vortex fluctuations in two-dimensional superconducting films. Gray, K.E.; Brorson, J.; Bancel, P.A. (Materials Science and Technology Division, Argonne National Laboratory, Argonne, Illinois). *Journal of Low Temperature Physics;* **59**: No. 5, 529-545(1 Jun 1985).

Recently theories of vortex fluctuations in two-dimensional superconducting films have been compared to the experimentally determined power law dependence of voltage on current and to the temperature-dependent resistance in small applied fields. Here an alternative interpretation of the power law and a practical difficulty of flux pinning for measurements in small fields are pointed out. To illustrate these points, experimental examples are presented for very homogeneous granular aluminum films.

39578 **Influence of erosion and redeposition processes on the lifetime of impurity control components: An assessment for TiC coatings.** Brooks, J.N.; Kaminsky, M. (Applied Physics Division Argonne National Laboratory, Argonne, Illinois). *Fusion Technology;* **6**: No. 2, 465-474(Sep 1984). (CONF-8309103—).

From 9. international vacuum congress and 5. international conference on solid surfaces; Madrid, Spain (26 Sep 1983).

A REDEP computer-code-analysis has been performed for the transport, ionization, and redeposition of physically sputtered material in the boundary regions of the FED/INTOR tokamak. The analysis was performed for TiC as a candidate coating material for the bottom limiter and the divertor plate. This analysis provides the first assessment of the influence of preferential sputtering of TiC on sputter erosion and redeposition. The results indicate that at high edge temperatures, the different transport properties of the constituents causes significant differences in both the erosion and redeposition rates for the elemental constituents carbon and titanium. At low plasma edge temperatures, < about 50 eV, TiC is marginally acceptable, having a high gross erosion rate but a fairly low net rate.

39579 **Stress-corrosion cracking of Inconel alloy 600 in high-temperature water - an update.** Bandy, R.; Van Rooyen, D. (Brookhaven National Lab., Upton, NY). *Corrosion (Houston);* **40**: No. 8, 425-430(Aug 1984).

An experimental program on stress corrosion cracking (SCC) aimed at the development of a quantitative model for predicting the behavior of Inconel 600 tubing in high temperature water is described. Empirical data are gathered to relate factors that influence SCC. Work involves U-bends, constant extension rate tests (CERT), and constant load. Plots are made of failure time and crack velocity vs temperature, and also of SCC time vs stress, using a variety of environments related to the ingredients of primary or secondary water. Cold work of Alloy 600 is also included. The effect of temperature is found to yield-semi-log (Arrhenius) curves, and log-log plots of failure time vs stress are presented. Curves of this type are being evaluated for use in extrapolating accelerated test data to operating conditions for predictive purposes. 5 references, 8 figures, 3 tables.

39580 **Energy-beam processing studies on Ta/U and Ir/Ta systems.** Kaufmann, E.N.; Peercy, P.S.; Jacobson, D.C.; Draper, C.W.; Huegel, F.J.; Echer, C.J.; Makowiecki, D.M.; Balser, J.D. (Lawrence Livermore National Lab., CA). *Materials Research Society Symposia Proceedings;* **23**: 763-768(1984). Contract W-7405-ENG-48.

Films of Ta metal on uranium and of Ir metal on tantalum were irradiated and melted by pulses from Q-switched Ruby and frequency-doubled Nd:YAG lasers to investigate the nature of the resulting mixtures in light of the very different binary-phase diagrams of the two systems. In addition, a two-phase Ir-Ta alloy was surface-processed with CW CO_2-laser radiation and with an electron beam in order to study microstructure refinement and test the advantage of using alloys as opposed to film-on-substrate combinations for the development of claddings. 4 references, 6 figures.

39581 **Molybdenum solubility differences in MC phases formed in titanium and niobium modified austenitic stainless steels determined using AEM.** Maziasz, P.J. (Oak Ridge National Lab., TN). *Proceedings - Annual Meeting, Electron Microsopy Society of America;* **42**: 496-497(1984). Contract W-7405-ENG-26.

MC particles were extracted on replicas from as-solution annealed (1 h at 1050°C) type 316 + Ti (0.25 wt %), from SA 316 + Ti aged for 2770 h at 600°C, and from as-solution annealed type 316 + Nb (0.15 wt %) stainless steels. Finally, MC particles were analyzed in foil for SA type 347 stainless steel, stabilized for several hours at ~900°C. Analysis was performed on JEM 100CX and Philips EM400 AEMs. Substantial molybdenum (~20 wt %) is dissolved in the Ti-rich MC particles formed in the SA 316 + Ti, in contrast to the behavior of MC in the other alloys. Most MC particles analyzed in the various specimens were larger than 10 nm in diameter. 4 references, 2 figures.

39582 **Thermal and electrical conductivities of an improved 9 Cr-1 Mo steel from 360 to 1000 K.** Williams, R.K.; Graves, R.S.; McElroy, D.L. (Oak Ridge National Lab., TN). *International Journal of Thermophysics;* **5**: No. 3, 301-313(1984). Contract W-7405-ENG-26.

The electrical and thermal conductivities and Seebeck coefficients of three 9 Cr-1 Mo samples were measured over the temperature range 360-1000 K. All of the samples were in the normalized and tempered condition and two of the samples were from different heats of a new, modified alloy. The thermal conductivity of the third sample, which was from a commercial heat, was found to agree well with the ASME code values for this steel. The two heats of modified 9 Cr-1 Mo were found to have significantly higher thermal conductivities and this difference appears to be due to the lower Si content of the modified alloy. The results were compared with the predictions of standard transport theory and data on bcc Fe. These comparisons show that phonon energy transport is important and quite dependent upon the Si content. 24 references, 6 figures, 2 tables.

39583 **Microcrystallography and chemical microanalysis of polycrystalline Nb_3Sn superconductors.** Taftoe, J.; Sabatini, R.L.; Suenaga, M. (Brookhaven National Lab., Upton, NY). *Proceedings - Annual Meeting, Electron Microsopy Society of America;* **42**: 512-513(1984).

Small amounts of certain alloying elements, in particular Ti and Ta, increase the upper critical magnetic field in superconducting Nb_3Sn. In order to understand the influence of alloying elements on the superconducting properties, knowledge about the site occupancy of the alloying elements is important. The authors used the ALCHEMI technique (described in J. Appl. Cryst. 15: 378(1982)) to locate alloying elements in Nb_3Sn. This problem differs from previous ALCHEMI studies in that the material is fine grained and the interior of individual crystal grains has to be analyzed by using a small electron probe. The (222) systematic row was used. ALCHEMI experiments were performed on a Nb_3Sn specimen containing 3 at.% Ti and one containing 2 at.% Ta, and it was found that both elements occupy the Nb site. The usefulness of analytical electron microscopy is demonstrated. By using a small electron probe and detecting the x-ray signal, spatial variations in composition and a microscopic scale as well as crystal-site occupancy of low atomic concentrations in small crystal grains were determined. 5 references, 3 figures.

39584 **Experimental determination of the critical cavity radius in Fe-10% Cr for ion irradiation.** Horton, L.L. (Oak Ridge National Lab., TN). *Proceedings - Annual Meeting, Electron Microsopy Society of America;* **42**: 484-485(1984). Contract AC05-84OR21400.

Transmission electron microscopy was used to obtain a value for the critical radius for ion bombardments of the ferritic alloy Fe-10% Cr. Microstructural examinations were performed with JEM 120 and JEM 120 CX transmission electron microscopes (TEM). For observation of magnetic specimens, the JEM 120 C TEM was equipped with an AMG objective lens pole piece. Specimens were implanted with 300 appm followed by a 2 h heat treatment at 1000 K. This procedure established a population of small helium bubbles in the specimens. The specimens were then irradiated at 850 K with 4 MeV Fe^{++} ions to a damage level of 30 dpa. The heavy ion damage caused the formation of a cavity distribution consisting of a population of large cavities (av diam, anti d, 15.2 nm) and a population of small cavities (av diam 2.3 mm). Histograms of the cavity diameters for each population are shown. The small cavities constituted approximately 98% of the total cavity concentration. 2 references, 1 figure.

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 38662, 38662, 40931

39585 (BMFT-FB-T—84-285) High-temperature fracture mechanics of silicon-nitride. Kriz, K. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 77p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE85752197.

The extension of slow crack growth measurements to further HPSN-Grades (MgO, Y_2O_3, MgO+AlN as sintering aids) and up to temperatures of 1500°C represents the main point of the present work, which continues the project NTS 1011. A new testing method created allows indirect determination of crack growth rates despite of superposed creep deformations. Measurements of other properties - like fracture toughness, creep resistance, elastic and attenuation constants seave together with SEM- and TEM-investigations the limitation of possible fracture mechanisms. Below approx.= 800°C the slow crack growth in MgO-doped HPSN-Grades is dominantly influenced by the corrosion attack of water molecules on the grain boundary phase. The Y_2O_3 doped grade shows not such an effect and breaks up to 1200°C transcrystalline. Above 800°C local softening of the grain boundary phase influences increasingly the fracture behaviour of all investigated HPSN-Grades, although there is a higher viscosity of the Y_2O_3 containing phase. It is suggested here, that the fracture behaviour will be increasingly influenced by the formation of a process-zone near the crack tip. Grain boundary sliding and secondary cracking in this zone lead first to rising crack resistance before the decreasing viscosity of the grain boundary phase overcompensates these effects. In this range the fracture mechanism is similar for all investigated HPSN-Grades and is dependent on crack growth rate.

39586 (CONF-850890—7) Magnetic behavior of transition metal substituted $CeRh_3B_2$: destabilization of the 4f moment. Malik, S.K.; Umarji, A.M.; Shenoy, G.K.; Reeves, M.E. (Argonne National Lab., IL (USA); Illinois Univ., Urbana (USA)). Jun 1985. Contract AC02-76ER01198;W-31-109-ENG-38. 13p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014991.

From International conference on magnetism; San Francisco, CA, USA (26 Aug 1985).

$CeRh_3B_2$ is magnetically ordered with a low moment of 0.4 μ/sub B/ but an unusually high Curie temperature (T/sub C/) of 115°K. Replacement of 10% Rh by Ru or Os (but not Ir) results in a sharp decrease in the 4f moment and T/sub C/. This behavior is thought to arise from the changes in the hybridization of the 4f electrons of Ce with 4d, 5d electrons of Rh, Ru, Os and Ir. At the other extreme, $CeRu_3B_2$ and $CeOs_3B_2$ exhibit superconductivity.

39587 (CONF-8505138—11) Microscopic investigation of NbN sputtered films. Gray, K.E.; Kampwirth, R.T.; Capone, D.W. II; Vaglio, R. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015000.

From Materials and mechanisms of superconductivity conference; Ames, IA, USA (29 May 1985).

Many favorable properties of niobium nitride (NbN) sputtered films for high field magnets are significantly less favorable in bulk NbN (and other high-field superconductors) so that differences in the microstructure of sputtered NbN films are likely responsible for the improvements. Very thin transverse sections of sputtered films were studied by TEM. Such studies reveal columnar grains. We report tunneling measurements that directly investigate T/sub c/ and the energy gap of individual grains. By placing electrodes above and below the film, preliminary measurements of the intrinsic resistivity of the individual columnar grains indicate values significantly less than the transport value. Measurements of the critical current density, J/sub c/, in NbN suggest that shearing of the flux line lattice does not limit J/sub c/, as in A-15 superconductors, no doubt due to the high density of pinning centers in NbN.

39588 (CONF-8506153—2) Refractory alloy performance: product form procurement and component fabrication. Harms, W.O. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 17p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014658.

From SP-100 systems selection committee review on fuels and materials conference; Los Alamos, NM, USA (20 Jun 1985).

39589 (INIS-mf—9645, pp 26-27) Electron microscopy study of factors affecting hydride phases in zirconium. Cann, C.D.; Sexton, E.E. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).

From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).

Summary.

39590 (SAND—85-0317C) Magnetic properties of shock-synthesized and furnace-reacted zinc ferrite. Venturini, E.L.; Morosin, B.; Graham, R.A. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 7p. (CONF-850736—25). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014840.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

The static magnetic properties of spinel structure zinc ferrite are compared for products from shock synthesis and conventional isothermal reaction using a stoichiometric mixture of zinc oxide and ferric oxide powders. The high-pressure shock-wave loading produces a ferrimagnetic material with a substantial saturation magnetization, while the furnace reaction product is paramagnetic at room temperature. Since stoichiometric zinc ferrite is paramagnetic, these results indicate that a zinc-deficient ferrite is formed by shock processing in contrast to a nearly stoichiometric compound obtained by heating in air. X-ray diffraction data confirm that less zinc oxide is consumed than ferric oxide during shock loading.

39591 (SAND—85-0333C) Synthesis of nickel-aluminum alloys by shock compression of composite particles. Pak, H.R.; Horie, Y.; Graham, R.A. (New Mexico Inst. of Mining and Technology, Socorro (USA); North Carolina State Univ., Raleigh (USA); Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 7p. (CONF-850736—40). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015165.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

We report electron microscope observations of compound formation in Ni/Al composite powders by shock loading. Reactions with substantial yield are seen in outer areas of a recovered specimen, while unreacted or locally reacted regions are seen in the center and middle areas of the specimen. Ni_3Al is formed in a gamma solid-solution of Ni. The microstructure is very complex.

39592 (SAND—85-0405C) X-ray diffraction studies of shock-modified inorganic materials. Morosin, B.; Graham, R.A. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 16p. (CONF-850889—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015150.

From International conference on metallurgical applications of shock wave and high-strain rate phenomena; Portland, OR, USA (28 Jul 1985).

Detailed analysis of broadened x-ray diffraction peak profiles has yielded information on the resulting residual lattice strain and reduced coherent crystallite size on a range of materials subjected to high pressure shock loading. Strain and size values are dependent on various procedures and models used for analysis of such peak profiles; however, trends on such strain and size data as a function of shock-loading pressure and shock temperature depend very strongly on the material. For example, shock-modified rutile shows annealing behavior at modest shock compression (20-27

GPa) due to shock temperature. Alumina and aluminum nitride appear to saturate to high strain values at the same conditions. Titanium diboride appears to show a pressure threshold in excess of 10 GPa before any plastic deformation occurs. The unusually large plastic deformation achieved in brittle inorganic powders indicates the unique nature of shock deformation; such deformations are not typically achieved by using other techniques. Such defective materials exhibit increased chemical activity and present the potential for synthesis of new substances as well as an opportunity to influence materials technology.

39593 **(SAND—85-1514C) Analytical electron microscopy study of shock synthesized zinc ferrite.** Carr, M.J.; Graham, R.A. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 6p. (CONF-850736—32). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015144.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

Mixtures of zinc oxide and hematite were shock loaded to various conditions, some of which resulted in the formation of zinc ferrite. Selected samples of reacted and unreacted mixtures were examined for the presence of zinc ferrite. Shock synthesized ferrite, having the spinel crystal structure, was found to occur as recrystallized regions within a heavily deformed matrix of well mixed reactants. The synthesized ferrite was not stoichiometric, but rather was found to be Zn/sub 1-x/Fe/sub 2+x/O_4, where x = 0.09 +- 0.02.

39594 **Further evidence for free electrons as dominating the behavior of electrochromic polycrystalline WO_3 films.** Goldner, R.B.; Norton, P.; Wong, K.; Foley, G.; Goldner, E.L.; Seward, G.; Chapman, R. (Electro-Optics Technology Center, Department of Electrical Engineering, Tufts University, Medford, Massachusetts 02155). *Applied Physics Letters;* **47**: No. 5, 536-538(1 Sep 1985). Contract AC03-82CE30753.

The results of two types of experiments on electrochromic (poly)crystalline films of rf sputtered WO_3 are presented as additional new evidence that the behavior (especially scattering) of the free electrons plays a dominant role in the electrochromic properties of such films.

39595 **Resolution of the nature of the ferromagnetic state in ternary $EuRh_3B_2$: Giant Moessbauer quadrupole splitting.** Shaheen, S.A.; Abd-Elmeguid, M.; Micklitz, H.; Schilling, J.S.; Klavins, P.; Shelton, R.N. (Experimentalphysik IV, Universitat Bochum, D-4360 Bochum 1, West Germany). *Physical Review Letters;* **55**: No. 3, 312-315(15 Jul 1985). Contract W-7405-ENG-82.

Determination of the magnetic properties of nearly stoichiometric $EuRh_3B2$ on macroscopic and microscopic levels reveals that its ferromagnetism originates from the ordering of the spins of divalent Eu perpendicular to the hexagonal c aixs. This finding contradicts previous reports of Rh 4d-band itinerant-electron ferromagnetism and a nonmagnetic trivalent Eu state. The value of the ^{151}Eu Moessbauer quadrupole splitting, e^2qQ = 48 +- 1 mm/s, is by far the largest ever reported for any Eu system and results from the extremely short Eu-Eu separation.

3603 Composite Materials

REFER ALSO TO CITATION(S) 39477

3604 Polymers And Plastics

REFER ALSO TO CITATION(S) 39715

39596 **(JAERI-M—83-119) Radiation resistant modification of silicone rubber. Studies on the heat and radiation resistant organic insulator of wires and cables for nuclear power generation plants (PWR).** Morita, Yohsuke; Hagiwara, Miyuki. (Japan Atomic Energy Research Inst., Tokyo). Aug 1983. 49p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701605.

For the use in the light-water nuclear power generation plants, wires and cables are required to keep flame retardancy and superior resistivity against heat and radiation throughout the whole period of service. They are expected, further, to fulfill their functions even under LOCA conditions. A new technology to give flame and radiation resistancy to insulating materials for general use in the nuclear power facilities was already reported in JAERI-M 82-057. The present study aimed subsequently to provide a method to give high radiation resistancy to dimethylsilicone rubber (DMS) which is used as highly heat resistant insulating materials (thermal tolerance, 180°C). For the improvement of radiation resistancy, the effects of polymer blending were examined by blending DMS with other rubbers, e.g., ethylene-propylene diene rubber (EPDM) or tetrafluoroethylene-propylene copolymer (Copoly (TFE-P)), which show different degradation behavior each other when exposed to radiation. After detailed experimental works, it was elucidated that the blended rubbers show higher radiation resistance (150 -- 200 Mrad) than DMS. In particular when DMS-Copoly (TFE-P) blend was incorporated with a small amount of CeO_2, high heat and radiation resistivity and satisfactory electrical performance were shown in the sequential tests (heat aging (220°C, 4 days) → radiation (200 Mrad) → super heated steam (150°C, 1 day)) according to IEEE standards for simulated LOCA on wire specimen. On the other hand, DMS without any modification lost its performance as insulator by the irradiation (200 Mrad).

39597 **(JAERI-M—83-128) Iodine-initiated, solid-state copolymerization of tetraoxane with 1,3-dioxolane in the presence of methylal.** Morita, Yousuke. (Japan Atomic Energy Research Inst., Tokyo). Sep 1983. 143p. (In Japanese). NTIS (US Sales Only), PC A07/MF A01. File Number DE85701600.

The iodine-initiated, solid-state copolymerization of tetraoxane with 1,3-dioxolane in the presence of methylal has been studied using 15 l kneader-type reactor. It was found that tetraoxane can be easily copolymerized with 1,3-dioxolane by a small amount of iodine as initiator and gives oxymethylene copolymer with excellent thermal stability in a high yield. The copolymerization was largely influenced by the concentrations of iodine, 1,3-dioxolane, and methylal, and by addition method of 1,3-dioxolane-methylal solution. In order to elucidate the copolymerization mechanism, the properties of the copolymer have been studied using high resolution NMR spectroscopy, scanning electron microscopy, differential scanning calorimetry, and gel permeation chromatography. These results show that this copolymerization system is characterized by a reaction that proceeds from the surface to the center of the tetraoxane crystals as if it were a core model. By evacuation of the polymeric system just after polymerization and by neutralization using gaseous ammonia, polymer particles including the residual reactants and impurities can be directly pelletized using a vent-type extruder to obtain the polyoxymethylene pellet with an excellent thermal stability and a well controlled molecular weight. Therefore, in the solid-state copolymerization of tetraoxane, the simple process for polyoxymethylene production has been achieved. The mechanical properties of the copolymer were also discussed and found to be intermediate between those of Duracon M-90 and Delrin 500 which are already commercial. Futher, an attempt has been made to utilize the fibrous polyoxymethylene crystal for reinforcement of a composite material.

39598 **(PB—85-187367) Thermal and mechanical properties of polyurethane foams at cryogenic temperatures. Final report.** Sparks, L.L.; Arvidson, J.M. (National Bureau of Standards, Boulder, CO (USA). Chemical Engineering Science Div.). 1984. 14p. Published in Proceedings of Society of the Plastics Industry (SPI) 28th Annual Technical/Marketing Conference, San Antonio, TX, November 5-7, 1984, p273-286.

Sponsored by Gas Research Inst., Chicago, IL.

Expanded plastics are used extensively for thermal insulation in cryogenic fuel facilities. Properties determined were thermal conductivity, thermal expansion, strength and moduli in compression and in tension, proportional limit, yield strength, ultimate strength, and shear strength. Physical properties were determined both parallel and perpendicular to the direction of foam rise. The gas content of the specimens was determined using a gas chromato-

graph-mass spectrometer, and the cell morphology was studied optically. Empirical procedures for estimating the temperature-dependent thermophysical properties are discussed. These procedures utilize the characterization parameters for molar gas concentration and cell morphology.

39599 **New stochastic treatment of fermions with application to a double-chain polymer.** Kung, D.; Dahl, D.; Blankenbecler, R.; Deza, R.; Fulco, J.R. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Physical Review [Section] B: Condensed Matter;* 32: No. 4, 2022-2029(15 Aug 1985). Contract AC03-76SF00515.

An extension of the stochastic algorithm as applied to Hamiltonian lattice field theories is developed. This new scheme will converge in problems that have intrinsic negative signs in the matrix elements. As an example, this scheme is applied to a two-chain polymer problem with (spinless) fermions that have a pairwise interaction. Because of the multiple connected structure of the double chain, this problem has intrinsic minus signs. It cannot be transformed into a bosonic problem with only positive matrix elements. Numerical results from this application of the new algorithm are presented for the energy and certain correlation functions for moderately long chains. A discussion of a modification of the method which will allow the treatment of much larger systems is discussed.

3606 Other Materials

REFER ALSO TO CITATION(S) 38872, 39000, 39000, 39009, 39252, 39264, 39309, 39486, 39487, 40391, 40448, 40456, 40877

39600 **(AD-A—153133/4/XAB) Materials-process interactions in ternary alloy semiconductors. Final report, 1 May 1982-31 October 1983.** Vaidyanathan, K.V.; Dunlap, H.L.; Kamath, G.S.; Wager, J.F. (Hughes Research Labs., Malibu, CA (USA)). Aug 1984. 42p. NTIS, PC A03/MF A01.

Properties of InGaAs, implantation doping of InGaAs, photoluminescence Properties of InGaAs, surface studies on InGaAs, and x-ray photoelectron spectroscopy and electron energy loss spectroscopy in InGaAs were studied. Electrical and optical properties of In(0.53)Ga(0.47)As layers grown by liquid phase epitaxy on InP substrates were investigated. Implantation-doping experiments to form n- and p-type layers in In(0.53)Ga(0.47)As are described. High degree of n-type electrical activation can be achieved in Si-implanted samples. Formation of p-type layers by Be- or Mg-ion implantation is much more difficult. X-ray photoemission (ELS) studies show that the native oxides present on chemically etched In(0.53)Ga(0.47)As consist predominantly of As_2P_3 and oxides of In. Plasma enhanced deposition of SiO_2 at 300°C does not significantly change the thickness of the native oxide.

39601 **(ARL/TR—065) Preparation, testing and dosimetric applications of $CaSO_4$ rare earth phosphors.** Calvert, R.L.; Danby, R.J.; Wilks, M.J. (Australian Radiation Lab., Melbourne). Mar 1984. 21p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781082.

The method now used at ARL to prepare single crystals and powders of undoped and rare earth doped $CaSO_4$ is outlined. TL glow curves and emission spectra obtained from the undoped samples as well as from samples of Dy, Gd, Eu, Tm, Sm, Dy:Eu and Dy:Tm doped $CaSO_4$ are presented. Possible dosimetric applications of these phosphors are also described.

39602 **(BMFT-FB-T—84-281) Development of corrosion-resistant heat exchangers for flue gas desulphurization.** Ernst, E.; Lorentz, R. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 71p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE85752193.

The goal of the project was the development of a glass lining for protection against corrosion in flue gas desulphurization plants. The construction should be carried out in cooperation with Steinmueller Company. The first step of development was to evaluate the available glasses under corrosive attack of fluoride-containing acids. With these results the corrosion properties of one-layer and two-layer glass enamels were optimized. Two-layer systems always showed better resistance and longer life. The optimized glass linings were tested in practice in a power plant in order to obtain data on their operating performance. Manufacturing principles for glass-lined heat exchanger elements were set up. A detailed design was not made. The optimized glasses may be used as protective linings for heat exchangers or parts thereof. Other uses in the flue gas area are possible.

39603 **(BNL—36415) Recovery of neutron-irradiated high-purity Si.** Snead, C.L. Jr.; Lynn, K.G. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 4p. (CONF-850169—14). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014212.

From 7. international conference on positron annihilation; New Delhi, India (6 Jan 1985).

High-purity Si single crystals have been neutron irradiated at ~100°C to several fluences to 2 x 10^{20} n/cm² (E > 1 MeV). Isochronal-annealing results using lifetime and Doppler broadening indicate a complex microstructural evolution of the Si with annealing temperature for the highest dose, going from divacancy, to quadrivacancy, to dislocation dominance of the trapping over four orders of magnitude in fluence. The lowest fluence features only divacancy effects.

39604 **(BNL—36634) Structural study of the high-pressure antiferroelectric phase of CsH_2PO_4.** Schuele, P.J.; Thomas, R. (Montana State Univ., Bozeman (USA). Dept. of Physics; Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 13p. (CONF-850880—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013309.

From 6. international meeting on ferroelectricity; Kobe, Japan (12 Aug 1985).

A three-dimensional neutron diffraction study has been carried out on the pressure-induced antiferroelectric phase of CsH_2PO_4. At 100.7°K and a hydrostatic pressure of 3.6 kbar, the unit cell parameters are a = 15.625(9), b = 6.254(2), c = 4.886(1) A, β = 108.08(3)° and Z = 4. Atomic parameters were determined using full-matrix least-squares methods which yield final agreement indices: R(F^2) = 0.0715, R/sub w/(F^2) = 0.0807 and S = 2.13. The structure is nearly consistent with the monoclinic space group $P2_1/a$ but refinement in $P2_1$ yields a slightly better fit. The structure is markedly different from those of the paraelectric and ferroelectric phases with large relative displacements (nearly 1 A) of Cs^{+1} and PO_4^{-3} groups in the x-z plane. Hydrogens bonding in b-chains, which are disordered in the paraelectric phase, show antiferroelectric order.

39605 **(BNL—36700) Positron diffusion in Si.** Nielsen, B.; Lynn, K.G.; Vehanen, A.; Schultz, P.J. (Brookhaven National Lab., Upton, NY (USA); Helsinki Univ. of Technology, Otaniemi (Finland). Lab. of Physics; Western Ontario Univ., London (Canada). Dept. of Physics). Jun 1985. Contract AC02-76CH00016. 4p. (CONF-850169—16). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014831.

From 7. international conference on positron annihilation; New Delhi, India (6 Jan 1985).

Positron diffusion in Si(100) and Si(111) has been studied using a variable energy positron beam. The positron diffusion coefficient is found to be D/sub +/ = 2.7 +- 0.3 cm²/sec using a Makhov-type positron implantation profile, which is demonstrated to fit the data more reliably than the more commonly applied exponential profile. The diffusion related parameter, E_0, which results from the exponential profile, is found to be 4.2 +- 0.2 keV, significantly longer than previously reported values. A drastic reduction in E_0 is found after annealing the sample at 1300 K, showing that previously reported low values of E_0 are probably associated with the thermal history of the sample.

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39606 **(CEA-CONF—7351) Narrow and broad solitons in the antiferromagnetic chains of $CsCoCl_3$ and TMMC.** Boucher, J.P.; Regnault, L.P.; Pires, A.; Rossat-Mignod, J.; Henry, Y.; Bouillot, J.; Stirling, W.G.; Renard, J.P. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)). Jun 1984. 6p. (CONF-8405211—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE85751925.

From Workshop on elementary excitations and fluctuations in magnetic systems; San Miniato, Italy (28 May 1984).

The two quasi one-dimensional (1D) compounds $CsCoCl_3$ and $(CH_3)_4NMnCl_3$ (TMMC) are almost ideal systems in which to study soliton excitations. Both they have antiferromagnetic (AF) couplings in the chains and at low temperature they exhibit an Ising symmetry favourable for the occurence of solitons. This symmetry is an intrinsic property of $CsCoCl_3$ while in TMMC it is only achieved by the application of an external magnetic field H perpendicular to the chains. In the lD short range order regime two energetically equivalent configurations are expected for the spins. Solitons can be seen as Bloch walls separating ordered domains and allowing the spins to pass from one configuration to the other. In the case of a "strong" Ising symmetry ($CsCoCl_3$) the walls are reduced to one lattice unit ("narrow" solitons) while in the case of a "weak" Ising symmetry (TMMC) the walls extend over several lattice units (10 to 30) ("broad" solitons). To maintain a paramagnetic state, these walls move rapidly along the chains inducing characteristic fluctuations. The investigation of these two compounds, $CsCoCl_3$ and TMMC illustrates the advantage of antiferromagnets as the AF mode yields an accurate determination of the soliton regime. Narrow and broad solitons are observed to behave very similarly.

39607 **(CONF-850755—2) Ionic transport in sodium germanate glasses.** Mundy, J.N.; Jin, G.L.; Peterson, N.L. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015007.

From Symposium on physics and chemistry of glass and glassmaking; Alfred, NY, USA (30 Jul 1985).

Measurements of the electrical conductivity and tracer diffusion coefficient have been made for a series of $XNa_2O:(1-X)GeO_2$ glasses, where X = 0.01, 0.05, 0.10, 0.15, 0.19, and 0.29. The Haven ratios determined from these measurements show the same trends as earlier work. The dc conductivities of the present study also show the same minimum in sodium ion mobility (at X ~0.09) as found in the earlier studies. The minimum is shown to be an interplay between the pre-exponential and exponential terms. The activation enthalpy remains almost constant for $X \leqq 0.09$ and then decreases rapidly with increasing X. These changes can be related to the average Ge-Ge separation which varies little below X ~0.08 but rapidly increases for larger X.

39608 **(CONF-850809—49) Sensitivity of using blunt and sharp crack models in elastic-plastic fracture mechanics.** Pan, Y.C.; Kennedy, J.M.; Marchertas, A.H. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 16p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85010288.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

J-integral values are calculated for both the blunt (smeared) crack and the sharp (discrete) crack models in elastic-plastic fracture mechanics problems involving metallic materials. A sensitivity study is performed to show the relative strengths and weaknesses of the two cracking models. It is concluded that the blunt crack model is less dependent on the orientation of the mesh. For the mesh which is in line with the crack direction, however, the sharp crack model is less sensitive to the mesh size. Both models yield reasonable results for a properly discretized finite-element mesh. A subcycling technique is used in this study in the explicit integration scheme so that large time steps can be used for the coarse elements away from the crack tip. The savings of computation time by this technique are reported. 6 refs., 9 figs.

39609 **(CONF-8505184—1) Melting of crystalline and amorphous silicon by Ruby, XeCl and KrF laser irradiation.** Aziz, M.J.; White, C.W.; Narayan, J.; Stritzker, B. (Oak Ridge National Lab., TN (USA)). Jun 1985. Contract AC05-84OR21400. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015040.

From Materials Research Society Europe conference; Strasbourg, France (13 May 1985).

Pulses of radiation from a ruby laser (λ = 693 nm, FWHM = 12 ns), a XeCl excimer laser (λ = 308 nm, FWHM = 25 and 70 ns), and a KrF excimer laser (λ = 248 nm, FWHM = 32 ns) have been used to induce melting of crystalline silicon and thin (<1 μm) amorphous layers of Si on crystalline silicon substrates. Depths of melting in crystalline Si were measured by TEM observations of the removal of dislocation loops created by low-dose ion implantation. Depths of melting of amorphous Si layers were monitored by observing the boundaries between a large polycrystalline region, assumed to form by normal melting from and resolidification back to the free surface, and a fine polycrystalline region, assumed to form by the explosive propagation inward of a thin buried liquid layer. In this work we report the comparison of predictions of heat flow calculations to the measured depth of melting in both crystalline and amorphous silicon. Excellent agreement is found with the Ruby and the XeCl results. Reasonable agreement with the KrF results is obtained only if the silicon liquid phase reflectivity at 249 nm is significantly less than that obtained by extrapolation of the optical parameters from longer wavelengths.

39610 (INIS-BR—279, pp 220) **Study of diffusion mechanisms of helium atoms in face-centered cubic metals after α - implantation in a cyclotron.** Sciani, V.; Lucki, G.; Jung, P. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil). 1984. NTIS (US Sales Only), PC A10/MF A01. File Number DE85781265. (CONF-8408159—Vol.4).

From 4. Japan-Brazil symposium on science and technology; Rio de Janeiro;Sao Paulo, Brazil (6 Aug 1984).

Helium has been homogeneously introduced into gold foils at room temperature by alpha implantation in a CV-28 cyclotron. After implantation the helium release was observed in isothermal and linear heating experiments. The diffusion coefficient follows an Arrhenius behaviour with $D_0 = 0.1\ cm^2/s$ and $\Delta H = 1.7$ eV. Possible diffusion mechanisms are discussed.

39611 (INIS-mf—9645, pp 50-51) **Auger electron microanalysis of sphene-based glass ceramic.** Hocking, W.H.; Doern, F.E.; Hayward, P.J.; Cecchetto, E.V. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).

From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).

Summary.

39612 **(INIS-mf—9702) Magnetic, electric and optic properties of liquid crystals.** Florea, St.C. (Institutul de Fizica si Inginerie Nucleara, Bucharest (Romania)). 1980. 25p. (In Romanian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701745.

Summary of a doctorate thesis.

We study the nematic liquid crystals of thermotrop type. We also studied the crystals whose mesomorphism occured both at temperature increasing and decreasing and during the supercooling phase (monotrope). Investigation results performed by us have had in view the following: clearing up and experimental support of a new mechanism of nuclear relaxation in liquid crystals, proposed by author; usage of experimental techniques and methods for to characterize and test some mesomorph media used in very important applications, such as color TV.

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39613 **(INIS-mf—9705) Study of the deviation influence from the lattice upon the transport properties providing equilibrium and non-equilibrium conditions.** Ciurea, M.L. (Institutul de Fizica si Inginerie Nucleara, Bucharest (Romania)). 1981. 25p. (In Romanian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701746.

Summary of a doctorate thesis.

Measurements of photoconduction, photovoltaic effect, TSC, TSDC and induced photoconductionwere performed on 2 types of shells with irregular lattice: oolycrystal line CdTe deposited by cathode disintegration and amorphous As_2Se_3 deposited by flash vaporization. CdTe shells of (1-7) μm thickness, deposited at low temperatures were determined to have a microcrystalline or amorphous structure (for U = 4 kV); those deposited at intermediate temperatures have either cubical structure (for U < 4 kV), or contain 6 H and 8 H (for U = 4 kV); the shells deposited at high temperatures contain a mixture of cubical and hexagonal structure. Measurements were performed on shells of 1-1.5 μm, and deposited at high temperatures. These shells are made up of acicular crystallites perpendicularly placed on the sub-shell. Existence of an anomalous photovoltaic tension was noticed in the coplanar structure, this tension being explained by the existence of the almost 10^4 potential barriers placed within crystallite interface. Photovoltaic effect is normal in the sandwich structure because, on an average, there is at the most one sphalerit-wurtzit heterojunction within the whole thickness of the sample the intricate rate of spectral dependence curves of photoconduction and photovoltaic tension in sandwich and coplanar structures is explained by the existence of 5 heterojunctions tested at different depths, namely: <= p.q5 μm; 0.155 μm; 0.172 μm; 0.35 μm; 0.4 μm. 2 capture levels placed at 0.12 eV and 0.35 eV in the forbidden region, non-uniformly distributed within the probe (in the acicular crystallite interface) were brought into evidence by means of TSDC measurements confirmed by TSC measurements. 0.47 eV level is uniformly distributed within the probe, in needles volume probably. A model for the level structure of As_2Se_3 shells was proposed.

39614 (INIS-SU—282, pp 571) **LSF-spline method for describing annihilation gamma-quanta angular correlation curves for yttrium-aluminium garnets.** Belyaev, V.N.; Mikheev, A.N.; Lyubchenko, O.S. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39615 **(INPE—3066) Impurity states in two-and three-dimensional disordered systems.** Silva, A.F. da; Fabbri, M. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). Apr 1984. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701714.

The microscopic structure of the impurity states in two-and three-dimensional (2D and 3D) disordered systems is investigated. A cluster model is outlined for the donor impurity density of states (DIDS) of doped semiconductors. It is shown that the impurity states are very sensitive to a change in the dimensionality of the system, i.e., from 3D to 2D system. It is found that all eigenstates become localized in 2D disordered system for a large range of concentration.

39616 **(LA-UR—85-1284) Latest results from the Seismic Category I Structures Program.** Bennett, J.G.; Dove, R.C.; Dunwoody, W.E.; Farrar, C. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 10p. (CONF-850809—59). NTIS, PC A02/MF A01; GPO Dep. File Number DE85010705.

From 8. international conference on structural mechanics in reactor technology; Brussels, Belgium (19 Aug 1985).

With the use of scale models, the Seismic Category I Structures Program has demonstrated consistent results for measured values of stiffness at working loads. Furthermore, the values are well below the theoretical stiffnesses calculated from an uncracked strength-of-materials approach. The scale model structures, which are also models of each other, have demonstrated scalability between models. The current effort is to demonstrate that the use of microconcrete and other modeling effects do not introduce significant distortions that could drastically change conclusions regarding prototype behavior for these very stiff, shear dominated structures. 3 refs., 3 figs., 1 tab.

39617 **(LA-UR—85-2055) Statics and adiabatic dynamics of nonlinear excitations in defected polyacetylene.** Phillpot, S.R.; Baeriswyl, D.; Bishop, A.R.; Lomdahl, P.S. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 12p. (CONF-8504157—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014118.

From Synthetic metals III workshop; Los Alamos, NM, USA (9 Apr 1985).

Within the Su, Schrieffer and Heeger model we have calculated, both analytically and numerically, the effects of model impurities on the electronic structure and lattice distortion of trans-polyacetylene. We find that the electron-phonon coupling may result in a fundamental alteration of the impurity level location. In simulated photoexcitation experiments on the defected system we find that, in addition to the kinks and breathers produced in the undefected system, "trapped kinks", excitons and polarons may also be produced. We suggest that the polarons produced in this novel way may be unusually stable and play an important role in hopping conduction mechanisms.

39618 **(MLM—3272) Physical property changes of a lithia-alumina-silica based glass as a function of composition.** Kramer, D.P.; Harville, G.L.; Buckner, D.A.; McCarthy, J.P.; Nease, A.B.; Sullenger, D.B. (Monsanto Research Corp., Miamisburg, OH (USA). Mound). 22 Jul 1985. Contract AC04-76DP00053. 41p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015610.

The effect of compositional changes on various physical properties (coefficient of thermal expansion, crystalline phases, and refractive index) both before and after devitrification (when appropriate) on a lithia-alumina-silica-based glass was determined. The results obtained by adding or subtracting various amounts of the compositional oxides (lithium carbonate, potassium carbonate, ammonium phosphate, alumina, boric acid, or silica) one at a time showed that compositional changes had a pronounced influence on the resultant physical properties of these glasses.

39619 **(PB—85-189793/XAB) Increase in U-value of a wall caused by mortar joints.** McIntyre, D.A. (Electricity Council Research Centre, Capenhurst (UK)). Jun 1984. 17p. (ECRC/M—1843). NTIS, PC E03/MF E03.

Following the recent revisions to the building regulations, low conductivity insulating blocks have been marketed which are claimed to provide a wall U-value of 0.6 W/sq m K using conventional cavity construction and no additional insulation. Finite-element analysis has been used to investigate heat flow in the wall structure. Conventional mortar joints degrade the U-value from the nominal 0.6 to an actual 0.7 W/sq m K. This memorandum examines heat loss through mortar joints in some detail and shows how the U-value of a wall varies with mortar thickness and thermal conductivity.

39620 **(PUC-TN—02/82) MC-INDO calculations of LiF, NaCl, LiCl and NaF crystals.** Matos, M.; Maffeo, B. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). Feb 1982. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701716.

MC-INDO calculations of LiF, NaCl, LiCl and NaF crystals were performed in order to verify the generality of the parameterisation scheme in which a direct fit of crystalline properties is proposed. Results indicate that the scheme is sufficiently general and an appropriate scaling of the STO's is suggested to improve the agreement with experimental data.

39621 **(PUC-TN—03/82) MC-UHF INDO CI calculation of F centers in alkali halides.** Matos, M.; Maffeo, B. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1982. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701717.

The one-electron level structure of NaCl, NaF, LiF and LiCl crystals containing F centers is calculated using the INDO

method in the molecular cluster (MC) approximation. Spin-polarization is considered in the Unrestricted Hartree-Fock (UHF) formulation of the method and F-band transition energies are estimated through limited configuration interaction (CI).

39622 (SAND—85-0310C) Laser interferometer measurements of refractive index in shock-compressed materials. Wise, J.L.; Chhabildas, L.C. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 15p. (CONF-850736—43). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015505.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

Laser interferometer systems provide a means for probing the refractive index of transparent specimens subjected to dynamic compression. Previous interferometer measurements of optical properties under shock loading are reviewed for polymethyl methacrylate, fused silica, sapphire, nitromethane, and an aqueous solution of zinc chloride; various degrees of departure from Gladstone-Dale behavior are noted for these materials. In addition, a detailed summary of recent optical studies of lithium fluoride (LiF) is provided. Interferometer data from plate-impact experiments verify sustained LiF transparency for Hugoniot stresses to at least 115 GPa, and establish the variation of LiF refractive index for shock amplitudes ranging from 1.58 to 115 GPa. The refractive-index data for LiF agree with earlier static and shock-wave data, and exhibit a pronounced deviation from predictions based on the Gladstone-Dale, Lorentz-Lorenz, and Drude relations. A modified form of the Gladstone-Dale relation is presented which correctly models the latest LiF measurements. Potential applications of LiF and other window materials to dynamic high-pressure experimentation are discussed.

39623 (SAND—85-0406C) Shock recovery experiments on PZT 95/5. Chhabildas, L.C.; Carr, M.J.; Kunz, S.C.; Morosin, B. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 6p. (CONF-850736—37). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015156.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

Recovery experiments on porous PZT 95/5 ferroelectric have been performed on a single-stage compressed gas gun over the stress range of 0.3 to 4.6 GPa. Density measurements on the recovered specimens suggest permanent pore compaction. X-ray diffraction analysis indicates that the shock-induced FE to AFE phase transformation is reversible, with a reduction in the residual lattice strain compared with the unshocked material. SEM and TEM microscopy show evidence of ferroelectric domains with fewer numbers at the higher stress. The microstructure of the 3.0 GPa sample is significantly affected as evidenced by dislocation slip bands and oval shaped voids.

39624 (SAND—85-0435C) Photosensitivity and imaging characteristics of ion-implanted PLZT ceramics. Land, C.E. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 21p. (CONF-850880—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015489.

From 6. international meeting on ferroelectricity; Kobe, Japan (12 Aug 1985).

We reported in previous papers that both the near-uv and the visible photosensitivities of ferroelectric-phase PLZT (lead lanthanum zirconate titanate) ceramics are increased by as much as four orders of magnitude by ion implantation or a combination of thermal diffusion of Al and ion implantation. New results are presented here on high-energy (1 MeV) implants of Al and Ni and coimplants of Al + Ne and Ni + Ne, and these results are compared with earlier 500 keV implants of Al and Cr and coimplants of Al + Ne and Cr + Ne as surface modification techniques for increasing the visible photosensitivity of PLZT. The important role of grain size in determining optimum contrast and resolution of stored optical information is described in terms of new experimental results.

39625 (SAND—85-1441C) Classical piezoelectricity: is the theory complete. Chen, P.J. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 14p. (CONF-8506159—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015492.

From Workshop on dynamical problems in continuum; Minneapolis, MN, USA (3 Jun 1985).

This paper cites experimental evidences which show that the classical theory of piezoelectricity is not complete in describing the responses of ferroelectric ceramics. There are also some preliminary evidences to show that the theory as applied to piezoelectric single crystals needs more thorough investigations.

39626 Elimination of dark line defects in lattice-mismatched epilayers through use of strained-layer superlattices. Gourley, P.L.; Biefeld, R.M.; Dawson, L.R. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Applied Physics Letters;* **47**: No. 5, 482-484(1 Sep 1985). Contract AC04-76DP00789.

The microscopic optical quality of thick (~1 μm) III-V semiconductor epitaxial layers, mismatched to their substrates, is examined by photoluminescence microimaging. The layers include several kinds of strained-layer superlattices (GaP/GaAs/sub x/P/sub 1-x/, GaAs/GaAs/sub 1-x/P/sub x/, and GaAs/In/sub x/Ga/sub 1-x/As) and associated alloys. Microscopic images of epilayer luminescence directly reveal the presence of misfit dislocations which appear as dark line defects. These defects can be completely eliminated in the strained-layer superlattices if these structures have thin layers, less than the critical thickness for elastic accommodation, and sufficient numbers of interfaces of block threading dislocations.

39627 In situ investigation of transport in semiconductors: A contactless approach. Skumanich, A.; Fournier, D.; Boccara, A.C.; Amer, N.M. (Center for Advanced Materials and Applied Physics and Laser Spectroscopy Group, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Applied Physics Letters;* **47**: No. 4, 402-404(15 Aug 1985). Contract AC03-76SF00098.

We present a spatially resolved contactless method for the study of electronic and thermal transport in semiconductors. The technique employs the deflection of a probe beam propagating through the material to measure thermal and electronic diffusivities, carrier lifetime, and surface recombination. This deflection results from both the thermally and electronically induced changes in the local index of refraction of the semiconductor.

39628 Direct measurement of the stop gap for the 31 475 cm^{-1} singlet a exciton of naphthalene. Stevenson, S.H.; Small, G.J. (Ames Laboratory—USDOE and Department of Chemistry, Iowa State University, Ames, Iowa 50011). *Journal of Chemical Physics;* **83**: No. 4, 1998-2000(15 Aug 1985). Contract W-7405-ENG-82.

The one-photon fluorescence excitation profile of the a exciton of naphthalene is reported. (AIP).

39629 Deposition and characterization of p-type cadmium telluride films. Chu, T.L.; Chu, S.S.; Firszt, F.; Naseem, H.A.; Stawski, R. (Southern Methodist University, Dallas, Texas 75275). *Journal of Applied Physics;* **58**: No. 3, 1349-1355(1 Aug 1985).

The deposition of CdTe films on foreign substrates by the direct combination of the elements in a gasflow system has the flexibility that the conductivity type and electrical resistivity of the film can be controlled by adjusting the composition of the reaction mixture. The deposition and properties of p-type CdTe films are emphasized in this paper because of its importance in thin-film solar cells. Graphite, W/graphite, mullite, and Corning 7059 glass were used as substrates for the deposition process. While CdTe films deposited on W/graphite and mullite substrates could be n or p type, depending on the composition of the reaction mixture, all films deposited on graphite substrates were p type, irrespective of the reactant composition, substrate temperature, or the purification of graphite, suggesting that carbon is electrically active in CdTe. The resistivity of p-type CdTe films on W/graphite and mullite sub-

strates has been controlled for the first time by (1) using a Cd-deficient reaction mixture, and (2) adding dopants (AsH_3 or PH_3) to the reaction mixture. The resistivity versus composition relation was studied in detail. The optical properties of nearly stoichiometric, Cd-deficient and Te-deficient CdTe films were also investigated.

39630 **Effects of As impurities on the solidification velocity of Si during pulsed laser annealing.** Peercy, P.S.; Thompson, M.O.; Tsao, J.Y. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Applied Physics Letters;* **47**: No. 3, 244-246(1 Aug 1985). Contract AC04-76DP00789.

The effect of As dopants on the solidification velocity during pulsed laser annealing of Si was measured using the transient conductance technique. At high concentrations, As is found to decrease the solidification velocity; for 7 at. % As, the velocity decreases ~20% as the interface approaches the peak of the As distribution, followed by a velocity increase when the interface exits the region of maximum As concentration. The measurements are interpreted in terms of a decrease in the melting temperature. The observation of surface nucleation to produce buried molten layers and internal nucleation of melt at higher As concentrations supports this interpretation.

39631 **Modulation-doped (Al,Ga)As/AlAs superlattice: Electron transfer into AlAs.** Drummond, T.J.; Fritz, I.J. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Applied Physics Letters;* **47**: No. 3, 284-286(1 Aug 1985). Contract AC04-76DP00789.

A modulation-doped superlattice of n-(Al,Ga)As and undoped AlAs has been grown by molecular beam epitaxy. At cryogenic temperatures, electrons transfer into the undoped AlAs layers and enhanced mobilities as high as 1000 cm^2/Vs are observed for the first time. It is shown that by properly accounting for the depth of the donor level in modulation-doped heterostructures reasonably good limits can be set on the gamma point conduction-band discontinuity at the heterojunction. It is found that this discontinuity is approximately 60—65% of the band-gap difference between the two alloys, in good agreement with other recent determinations.

39632 **Pressure increase of the electron-phonon interaction in superconducting hexagonal silicon.** Dacorogna, M.M.; Chang, K.J.; Cohen, M.L. (Department of Physics, University of California and Materials and Molecular Research Division, Lawrence Berkeley Laboratory, Berkeley, California 94720). *Physical Review [Section] B: Condensed Matter;* **32**: No. 3, 1853-1855(1 Aug 1985).

Using an ab initio pseudopotential approach, the pressure dependence of the electron-phonon interaction parameter λ and the phonon frequencies for metallic hexagonal phases of silicon is calculated. With changing pressure λ is found to go first through a minimum and then reach its maximum value near the phase transition from simple hexagonal (sh) to hexagonal close packed (hcp). At this point the superconducting transition temperature T/sub c/ is expected to be above 10 K. In the hcp phase Si is predicted to be superconducting with T/sub c/ in the same range as in the sh phase.

39633 **Arsenic-terminated Ge(111): An ideal 1 x 1 surface.** Bringans, R.D.; Uhrberg, R.I.G.; Bachrach, R.Z.; Northrup, J.E. (Xerox Palo Alto Research Center, 3333 Coyote Hill Rd., Palo Alto, California 94304). *Physical Review Letters;* **55**: No. 5, 533-536(29 Jul 1985).

Arsenic interaction with the Ge(111) surface results in the replacement of the outer Ge layer with an As layer. This system has a 1 x 1 symmetry and the calculated positions of the As atoms are very close to the positions expected from bulk bond lengths. Ge(111):As is thus a model ideal surface and a comparison is made of an experimental and a theoretical determination of its fully occupied surface band.

39634 **Kinetic modeling for hydrogen passivation of polycrystalline silicon.** Ginley, D.S.; Hellmer, R.P. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Journal of Applied Physics;* **58**: No. 2, 871-879(15 Jul 1985). Contract AC04-76DP00789.

The introduction of monatomic hydrogen into polysilicon grain boundaries has great potential for improving photovoltaic device efficiencies for thin-film and ribbon material. To optimize this process a more complete understanding of the relevant chemistry and kinetics is required. We discuss here two kinetic models of the passivation process: a one-dimensional Fickian model which is computationally easy and produces diffusion coefficients in good agreement with those in the literature and a two-dimensional model which though computationally complex provides a more accurate physical representation of the passivation process and more realistic grain-boundary diffusion coefficients for monatomic hydrogen. Both models appear to have practical utility for optimizing and understanding the passivation process. The nature of the site filling reaction is also discussed.

39635 **Pulse propagation in an absorbing film.** Halevi, P.; Fuchs, R. (Departamento de Fisica, Instituto de Ciencias, Universidad Autonoma de Puebla, Apartado Postal J-48, Puebla, Pueble 72570, Mexico). *Physical Review Letters;* **55**: No. 3, 338-338(15 Jul 1985). Contract W-7405-ENG-82.

A Comment on the Letter by S. Chu and S. Wong, Phys. Rev. Lett. 48, 738 (1982).

39636 **In-plane jump diffusion of Li in LiC_6.** Magerl, A.; Zabel, H.; Anderson, I.S. (Institut Laue Langevin, F-38042 Grenoble, France). *Physical Review Letters;* **55**: No. 2, 222-225(8 Jul 1985). Contract AC02-76ER01198.

Li diffusion in LiC_6 has been measured by high-resolution neutron spectroscopy both in the ordered phase between 630 and 675 K and in the disordered phase at 720 K. The in-plane diffusion constant D at 660 K is 1 x 10^{-6} cm^2/s, which increases to 24 x 10^{-6} cm^2/s above T/sub c/. At all temperatures, a jump-type diffusion mechanism was observed, with jump vectors connecting nearest Li-sublattice sites in the ordered phase, but nearest hexagon centers in the disordered phase.

39637 **Ultrahigh pressures: Optical observations and Raman measurements of hydrogen and deuterium to 1.47 Mbar.** Mao, H.K.; Bell, P.M.; Hemley, R.J. (Geophysical Laboratory, Carnegie Institution of Washington, Washington, D.C. 20008). *Physical Review Letters;* **55**: No. 1, 99-102(1 Jul 1985). Contract AS05-80ER10754.

Hydrogen and deuterium have been pressurized under static conditions to 1.47 Mbar, which is higher by a factor of 2 than previously reported static data. Measurements of the vibron indicate an initial increase and then a sharp decrease in frequency at pressures above 0.5 Mbar. At 1.14 Mbar the vibron frequency decreased to the zero-pressure value, and at 1.47 Mbar the frequency of the vibron in hydrogen is 90 cm^{-1} below the value of the vibrational mode of the isolated molecule. This pronounced softening of the vibron suggests strengthened intermolecular interaction.

39638 **Impulse approximation in solid helium.** Glyde, H.R. (Department of Physics, University of Delaware, Newark, Delaware 19715). *Journal of Low Temperature Physics;* **59**: No. 5, 561-578(1 Jun 1985). Contract FG02-84ER45082.

The incoherent dynamic form factor S/sub i/(Q, ω) is evaluated in solid helium for comparison with the impulse approximation (IA). The purpose is to determine the Q values for which the IA is valid for systems such a helium where the atoms interact via a potential having a steeply repulsive but not infinite hard core. For ^{3}He, S/sub i/(Q, ω) is evaluated from first principles, beginning with the pair potential. The density of states g(ω) is evaluated using the self-consistent phonon theory and S/sub i/(Q,ω) is expressed in terms of g(ω). For solid ^{4}He resonable models of g(ω) using observed input parameters are used to evaluate S/sub i/(Q,ω). In both cases S/sub i/(Q, ω) is found to approach the impulse approximation S/sub IA/(Q, ω) closely for wave vector transfers Q> or $\approx$20 A^{-1}. The difference between S/sub i/ and S/sub IA/, which is due to final state interactions of the scattering atom with the remainder of the atoms in the solid, is also predominantly antisymmetric in (ω-ω/sub R/), where ω/sub R/ is the recoil frequency. This suggests that the symmetrization procedure proposed by Sears to eliminate final state contributions should work well in solid helium.

39639 Use of optical emission spectroscopy as a diagnostic technique for plasma deposition of hydrogenated amorphous silicon and carbon. Kampas, F.J. (Brookhaven National Lab., Upton, NY). *Materials Research Society Symposia Proceedings;* 30: 291-296(1984). Contract AC02-76CH00016.

Optical emission intensities were measured as a function of composition for silane-argon and silane-hydrogen mixtures used in the deposition of hydrogenated amorphous silicon. It was found that changes in silane fraction have a large effect on the electron concentration and energy distribution in the discharge. 8 references, 4 figures.

39640 Crystallinity, morphology, and conductivity of boron-doped microcrystal-line silicon. Rajeswaran, G.; Tafto, J.; Sabatini, R.L.; Vanier, P.E. (Brookhaven National Lab., Upton, NY). *Materials Research Society Symposia Proceedings;* 31: 159-164(1984). Contract AC02-76CH00016.

Boron-doped microcrystalline (μc) silicon films produced by rf glow discharge from dilute (1%) mixtures of SiH_4 in H_2 show a critical dependence of conductivity on deposition conditions. The dark conductivity was related to the microscopic features using electron microscopy. The μc-Si:H films contain clusters of crystallites embedded in an amorphous matrix. The size of the crystalline clusters is typically 0.2 μm in diameter, and the size of the individual crystallites is about 2.5 nm. Electron micrographs of samples prepared at substrate temperatures T/sub s/ = 135°C, 150°C, 165°C, and 180°C show that the number of crystalline clusters increases with T/sub s/ up to 165°C. At T/sub s/ = 180°C, the crystallites completely disappear. When the concentration of SiH_4 in H_2 is decreased to 0.25%, the microstructure shows a high density of crystallites with no apparent clustering. 6 references, 7 figures.

39641 Structure of phosphorus-selenium glasses. I. Concentration dependence of the short- and intermediate-range order. Price, D.L.; Misawa, M.; Susman, S.; Morrison, T.I.; Shenoy, G.K.; Grimsditch, M. (Argonne National Lab., IL). *Journal of Non-Crystalline Solids;* 66: 443-465(1984).

The structures of phosphorus-selenium glasses P/sub x/Se/sub 1-x/ with x = 0 (pure selenium), 0.05, 0.15, 0.25, 0.40, and 0.50 were investigated with neutron diffraction extended x-ray absorption fine structure measurements, and Raman and infrared spectroscopy. The behavior of the near-neighbor coordination at r ~ 2.3 A as a function of x suggests a picture in which P_4Se/sub n/ molecular units are linked together by Se atoms or chains. The diffraction patterns exhibit anomalous peaks at Q ~ 1.2 A which rise dramatically as P is added to the Se glass; these peaks can also be understood on a molecular picture. The Raman spectra at the larger P concentrations are characterized by series of relatively sharp peaks which also suggest molecular units and for x = 0.5 bear a close correspondence to the spectrum of crystalline P_4Se_3.

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39642 (ORNL/TM—9371) PCB annual report for Oak Ridge National Laboratory, 1983. Eisenhower, B.M.; Horton, C.Y.; Barkenbus, B.D. (Oak Ridge National Lab., TN (USA)). Jul 1985. Contract AC05-84OR21400. 28p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85014775.

Stringent government regulations control the use and disposal of Polychlorinated Biphenyl (PCB) materials. These same regulations require accurate recordkeeping by the owner/operator of a facility where PCBs are in use. This report details ORNL efforts to comply with the Toxic Substance Control Act and the US Environmental Protection Agency's new regulations found in Title 40, Code of Federal Regulations (CFR). This document provides detailed records of PCB materials still in use, PCB wastes generated, their origins, storage of PCB wastes and off-site shipments of this waste during CY 1983.

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39643 (BARC—1215) Solvent extraction technology of ^{99}Mo-/sup 99m/Tc system: design and operational considerations. Noronha, O.P.D.; Sewatkar, A.B. (Bhabha Atomic Research Centre, Bombay (India)). 1983. 125p. NTIS (US Sales Only), PC A06/MF A01. File Number DE85781071.

The design features of ^{99}Mo-/sup 99m/Tc solvent extraction system have been reviewed. An improved semi-automated system has been improvised using the basic equipment of an indigenous unit along with other accessories, and with an added element of radiation protection to handle daily about 300-600 millicurie amounts of reactor-produced very low specific activity ^{99}Mo. The system has been used routinely for obtaining /sup 99m/TcO_4^- - required for diagnostic purposes in nuclear medicine for the last twelve years. The performance characteristics of this unit with respect to yield and purity of $^{99}TcO_4^-$ - consistency of the process, the radiation dose to personnel and related health physics aspects have been evaluated.

39644 (BARC—1219) X-ray fluorescence spectrometric and optical emission spectographic analysis of thoria in thoriated copper metal powder. Chandola, L.C.; Khanna, P.P. (Bhabha Atomic Research Centre, Bombay (India)). 1984. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781065.

Two methods, one using the X-ray fluorescence (XRF) spectrometric technique and another using optical emission spectrographic (OES) technique are described for the determination of thoria in the concentration range 0.5-10% in thoriated copper metal powder. The precision of XRF method is superior to OES method but when sample quantity is very small, the OES method is useful. For XRF method, 500 mg sample is mixed with boric acid binding material and converted to a tablet for analysis. For OES method, only 200 mg sample is needed which is glued to the flat ends of two graphite electrodes for excitation by AC arc. The precision obtained in XRF is better than +-1% and in OES it is +-23%.

39645 (CBPF-NF—081/83) X-ray absorption spectroscopy (EXAFS). Craievich, A.F. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1983. 18p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781055.

The experimental technics of Extended X-ray Absorption Fine Structure (EXAFS) is presented and several uses of it in atomic, molecular and bio physics are shown. The recent progresses of this technics, both theoretical and experimental, are discussed and the future perspectives on this subject are commented.

39646 (CEA-R—5293) Definition of quality criterions for the test of softwares used in gamma spectrometry: identification and dosage of radionuclides in a complex mixture. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). Dec 1984. 72p. (In French). NTIS (US Sales Only), PC A04/MF A01. File Number DE85751997.

Groupe de travail de reflexion G.T.R.5 du Comite d'Instrumentation de Radioprotection.

The possibility of testing the softwares implanted on automatic analysis systems is a need for users and manufacturers: - to evaluate their performances; - to improve their knowledge; - to realize or modify some programs. Following the intercomparison P.T.I. R. organized by L.M.R.I., the test presented in this document deals with the idenfication and dosage in terms of activity of the radionuclides present in a mixed spectrum. It needs a previous calibration with a reference spectrum and the use of a nuclear data file. Several quality criterions are proposed from the results obtained and from the authors' experience. They are distinguished according as they are used for evaluating the software itself or its processing by the user.

39647 (CNEA-NT—15/82) **Methodological aspects and development of techniques for neutron activation analysis of microcomponents in materials of geologic origin.** Cohen, I.M. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Dept. de Aplicaciones Tecnologicas; Buenos Aires Univ. Nacional (Argentina). Facultad de Ciencias Exactas y Naturales). 1982. 290p. (In Spanish). NTIS (US Sales Only), PC A13/MF A01. File Number DE85701906.

Some aspects of the activation analysis methodology applied to geological samples activated in nuclear reactors were studied, and techniques were developed for the determination of various elements in different types of matrixes, using gamma spectrometry for the measurement of the products. The consideration of the methodological aspects includes the study of the working conditions, the preparation of samples and standards, irradiations, treatment of the irradiated material, radiochemical separation and measurement. Experiments were carried out on reproducibility and errors in relation to the behaviour of the measurement equipment and that of the methods of area calculation (total area, Covell and Wasson), as well as on the effects of geometry variations on the results of the measurements, the RA-3 reactors's flux variations, and the homogeneity of the samples and standards. Also studied were: the selection of the conditions of determination, including the irradiation and decay times; the irradiation with thermal and epithermal neutrons; the measurement with the use of absorbers, and the resolution of complex peaks. Both non-destructive and radiochemical separation techniques were developed for the analysis of 5 types of geological materials. These methods were applied to the following determinations: a) In, Cd, Mn, Ga and Co in blende; b) La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu in fluorites; c) La, Ca, Eu, Tb, Yb, Se and Th in barites and celestites; d) Cu and Zn in soils. The spectral interferences or those due to nuclear reactions were studied and evaluated by mathematical calculation.

39648 (GSCan-P—84-1B, pp 41-46) **Quantitative determination of ^{210}Po in geochemical samples.** Dyck, W.; Bristow, Q. (Geological Survey of Canada, Ottawa, Ontario. Resource Geophysics and Geochemistry Div.). 1984. NTIS (US Sales Only), PC A19/MF A01. File Number DE85781279.

In Current research: Part B.

To test the usefulness of ^{210}Po in soils as a means of detecting buried U mineralization, methods for the determination of ^{210}Po were investigated and adapted for routine production of ^{210}Po data from geochemical samples. A number of conditions affecting autodeposition and detection of ^{210}Po were investigated. The optimum area of deposition with a 450 mm^2 solid state detector was found to be 300 mm^2. Convenience dictated room temperature over-night deposition times, although increased temperature increased speed and efficiency of deposition. A clear inverse relationship was observed between volume of solution and deposition efficiency with stirring times of less than 2 hours. For routine analysis, soil and rock powders were dissolved by leaching 1 g samples in teflon beakers successively with conc. HNO_3, HF, and HNO_3-$HClO_4$, evaporating the solution to dryness between leaches, and taking the residue up in 20 mL 0.5 M HCl. The ^{210}Po was deposited on 19 mm diameter Ni discs and counted with an alpha spectrometer system employing 450 mm^2 ruggedized surface barrier detectors. The method achieved 90 percent recovery of ^{210}Po from solution and a detection efficiency of 30 percent. With a counting time of 3 hours, the method is capable of detecting 0.2 pCi of ^{210}Po per gram of sample.

39649 (INDC(CCP)—221/L, pp 59-64) **Metrological parameters for the delayed neutron method of analysis of geological structures for uranium.** Vertman, E.G. Nov 1984. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781273.

Russian original distributed as INDC(CCP)-218/G.

In Translation of selected papers published in Nuclear Constants, Volume 3(52), Moscow 1983.

The "direct" delayed neutron method is shown to be a useful method to analyze standard rock and ore samples over a wide range of uranium concentrations. Comparison of the metrological parameters known at present with the method of determining uranium in geological objects suggests that the delayed neutron method meets the requirements of applied geochemistry much more satisfactorily and opens up for it new prospects.

39650 (INIS-mf—9573-Vol.5, pp 706-720) **X-ray fluorescence analysis.** Perez Novara, A.M. (Instituto Nacional de Investigaciones Nucleares, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A05/MF A01. File Number DE85781440.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Discussed are principles of X-ray fluorescence analysis, advantages of application of such techniques, X-ray equipment and sample preparation for analysis.

39651 (INIS-mf—9573-Vol.5, pp 689-705) **Neutron activation analysis.** Ley Koo, A.M. (Instituto Nacional de Investigaciones Nucleares, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A05/MF A01. File Number DE85781440.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Described is the basis for activation analysis, sample preparation, radiation count and the calculations necessary for these applications.

39652 (INIS-mf—9625, pp 7) **Use of aerosol standard in quality testing of instrumental neutron activation analysis results.** Obrusnik, I. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

39653 (INIS-mf—9625, pp 8) **Neutron activation determination of low manganese concentrations in standard biological materials.** Kucera, J.; Soukal, L.; Faltejsek, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

39654 (INIS-mf—9625, pp 9) **Instrumental neutron activation analysis of spiders from the vicinity of Most and Trebon.** Paukert, J.; Ruzicka, V. (Ceskoslovenska Akademie Ved, Pruhonice. Ustav Krajinne Ekologie); Obrusnik, I. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

39655 (INIS-mf—9625, pp 10) **Dry and wet ashing of biological materials.** Jiranek, V. (Ceskoslovenska Akademie Zemedelskych Ved, Prague. Vyzkumny Ustav Potravinarskeho Prumyslu); Tluchor, D. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

39656 (INIS-mf—9625, pp 11) **Tungsten determination in biological materials by neutron activation analysis.** Simkova, M.; Kucera, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

39657 (INIS-mf—9625, pp 12) **Use of neutron activation analysis in ascertaining differences in trace element levels in serum and hair of personnel of two car factories.** Kvicala, J.; Havelka, J.; Roehling, S.; Vana, S. (Vyzkumny Ustav Endokrinologicky, Prague (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

39658 (INIS-mf—9625, pp 13) **Recent development and applications of activation methods in radiochemical laboratory of Mineral Raw Materials Institute.** Randa, Z. (Ustav Nerostnych Surovin, Kutna Hora (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

39659 (INIS-mf—9625, pp 15) **Radionuclide X-ray fluorescence analysis of mineral materials using basic physical parameters.** Benada, J. (Ustav Nerostnych Surovin, Kutna Hora (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

39660 (INIS-mf—9625, pp 17) **Equipment for monitoring uranium concentration in solutions using soft gamma-ray absorption.** John, J.; Sebesta, F.; Spevackova, V.; Sedlacek, Ja. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia). Fakulta Jaderna a Fysikalne Inzenyrska). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

39661 (INIS-mf—9625, pp 21) **Methods of evaluating small sets of results of radioanalytical methods 3.** Podracky, P. (Ceskoslovenska Akademie Ved, Prague. Ustav Fyziky Plazmatu). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

39662 (INIS-mf—9645, pp 7) **Fully quantitative x-ray microanalysis using the SEM. Is it really feasible?.** Smith, D.G.W. (Alberta Univ., Edmonton (Canada). Dept. of Geology). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).

From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).

Abstract.

39663 (INIS-mf—9645, pp 16-17) **Applications of energy-loss spectroscopy in materials science.** Egerton, R.F. (Alberta Univ., Edmonton (Canada). Dept. of Physics). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).

From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).

Summary.

39664 (INIS-mf—9645, pp 18-19) **Comparative study of radiation damage by EELS and electron diffraction.** Misra, M.; Egerton, R.F. (Alberta Univ., Edmonton (Canada). Dept. of Physics). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).

From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).

Summary.

39665 (INIS-mf—9645, pp 48-49) **Introduction to quantitative microanalysis with the scanning Auger microprobe (SAM).** Aitchison, I. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).

From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).

Summary.

39666 (INIS-mf—9645, pp 52-53) **Precision in Auger analysis.** Mitchell, D.F. (National Research Council of Canada, Ottawa, Ontario). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).

From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).

Summary.

39667 (INIS-mf—9645, pp 14-15) **Quantification in very high resolution elemental maps of biological specimens by electron spectroscopic imaging.** Ottensmeyer, F.P.; Yu, A.; Arsenault, L.A. (Ontario Cancer Inst., Toronto (Canada)). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).

From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).

Summary.

39668 (INIS-mf—9646, pp 4-5) **Elemental microanalysis in an analytical electron microscope.** Zaluzek, N.J. (Argonne National Lab., IL (USA)). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Outline.

39669 (INIS-mf—9655, pp 40) **Characterisation of New Zealand greenstone sources by neutron activation analysis.** Merrony, C.J.N.; Aspinall, A.; Leach, B.F. 1983. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441. (CONF-830288—Absts.).

From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).

Abstract only.

39670 (INIS-mf—9655, pp 42) **Trace-element discrimination of distinct sources of native copper for archaeological provenance.** Rapp, G. (Minnesota Univ., Duluth (USA). Archaeometry Lab.). 1983. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441. (CONF-830288—Absts.).

From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).

Abstract only.

39671 (INIS-mf—9655, pp 38) **^{14}C sample preparation for analysis by tandem accelerator mass spectrometer (TAMS).** Lowe, D.C.; Wallace, G.; McCabe, W.J.; Sparks, R.J. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). 1983. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441. (CONF-830288—Absts.).

From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).

Abstract only.

39672 **(IPEN-Pub—64) Synergistic effect in the solvent extraction of some trivalent lanthanides. 1. Behaviour of the elements La and Yb in the HTTA-TBP, HTTA-HDEHP, HDEHP-TBP systems.** Favaro, D.I.T.; Atalla, L.T. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). May 1984. 23p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781069.

The behaviour of Yb and La in extraction systems was studied, using as extractant binary mixtures of thenoyltrifluoroacetone (HTTA), di-(2-ethyl hexyl) phosphoric acid (HDEHP) and tributylphophate (TBP), by means of the radioactive tracers ^{140}La and ^{169}Yb. Different concentrations of nitric acid and $NaNO_3$ as salting out were used in aqueous phase. Distribution coefficients obtained for the two elements, using a mixture of HTTA-TBP, were found to be much higher than those obtained with each of the extractants, showing synergistic effect. A small synergistic effect was seen to exist for La, but an antagonistic effect was observed for Yb, when a mixture of HTTA plus HDEHP was used in both cases. An antagonistic effect was also found for Yb by using a mixture of HDEHP and TBP, whereas the extraction of La was found to be independent of the TBP concentration when this mixture was employed.

39673 **(MINTEK-M—64D) Isotope-source neutron-activation analysis for the determination of manganese in bulk samples.** Watterson, J.I.W.; Andeweg, A.H.; Ramahlo, J. (Council for Mineral Technology, Randburg (South Africa)). 28 Feb 1982. 41p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781062.

A method for the rapid determination of manganese in ores, metals, and slags has been developed for use on site in the control of large submerged-arc ferromanganese furnaces. The method, which is suitable for samples that weigh several kilograms, requires a minimal amount of sample preparation. Isotope-source neutron-activation analysis (ISNAA) is used, a specially constructed apparatus being employed for irradiation and counting. The presence of boron in the ores presents a problem that was overcome by separate measurement of the neutron absorption. The theory that was developed confirms that this method is very suitalble for the analysis of bulk samples. Tests were done on a suite of samples that had been analysed by the use of X-ray-fluorescence spectrometry (XRFS). The root-meansquare (r.m.s.) deviations between the results for manganese by XRFS and ISNAA were found to vary from 0,7 per cent for the slags and 0,8 per cent for the ores to 1 per cent for the silico-manganese metal. This compares well with the r.m.s. deviations between the results for XRFS and the wet chemistry, each of which was used by a different laboratory on the same set of samples. With further development, ISNAA should yield even better results, and be suitable in a wide variety of applications.

39674 **(MINTEK-M—128) Determination of cyanide in hydrometallurgical process solutions and effluents by ion chromatography.** Pohlandt, C. (Council for Mineral Technology, Randburg (South Africa)). 8 Jun 1984. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781061.

Three methods are described for the determination of cyanide species in hydrometallurgical process solutions and in effluents. The determination of excess cyanide in the presence of weak metal cyanide complexes was achieved by the use of a flow-injection system with 0,05mM sodium chloride as the carrier stream. The procedure was found to be fast, precise (S/sub r/ 0,0142), and reasonably accurate. Free cyanide and cyanide derived from weak metal cyanide complexes were determined by ion chromatography. This method is free from interferences and precise (s/sub r/0,0112), and has a limit of determination of 10μg0l. The 'total' cyanide content of solutions was determined by ion chromatography after the strong metal cyanide complexes had been dissociated in hypophosphorous acid by ultraviolet irradiation. The procedure (of 10 minutes duration) is faster than conventional distillation methods, and is accurate and precise (S/sub r/0,027).

39675 **(MINTEK-M—134) NIMROC reference materials: revised values for thorium, yttrium, lanthanum, and the rare-earth elements.** Hansen, R.G.; Ring, E.J. (Council for Mineral Technology, Randburg (South Africa)). 25 Jun 1984. 35p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781066.

This report gives all the analytical results submitted by the contributing laboratories before July 1983 for thorium, yttrium, lanthanum, and the rare-earth elements in the six NIMROC reference materials (SARM 1 to 6), which were prepared in 1966 by the former National Institute for Metallurgy, now the Council for Mineral Technology (Mintek). The statistical evaluation of these results and the assignment of new or revised recommended or provisional values are described.

39676 **(NUCLEBRAS-CDTN—472) Utilization of epithermal neutrons for the determination of molybdenum in the presence of uranium.** Oliveira Melo, M.A.M. de. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). May 1984. 149p. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781063.

Activation analysis by means of selective activation with epithermal neutrons is proposed for the determination of molybdenum in samples when uranium is present. Instrumental activation analysis with epithermal neutrons is advantageous for the determination of elements with large resonance integral, as compared to its thermal neutron activation cross section. The main reason for using this method is the serious interference caused by ^{99}Mo produced by fission of ^{235}U. This effect is strongly reduced by using the epicadmium irradiation technique. The filter efficiency has been investigated by irradiation experiments with bare and cadmium-covered samples. A solvent extraction process for uranium, before irradiation, is proposed to reduce sample background. The determination of Mo in leach samples is proposed in order to support the analytical needs of Figueira and Pocos de Caldas Mineral Prospection Programme of Departamento de Tecnologia Mineral from CDTN/ NUCLEBRAS (MG,Brazil). The introduction of activation analysis with epithermal neutrons as a routine analytical tool in CDTN is our main goal. This method represents one more opportunity for exploring the analytical facilities available at TRIGA MARK I IPR-R1 nuclear reactor.

39677 **(NUCLEBRAS-CDTN—473) Dissolution of thorium/uranium mixed oxide in nitric acid-hydrofluoric acid solution.** Filgueiras, S.A.C. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). 1984. 143p. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781067.

The dissolution process of thorium oxide and mixed uranium-thorium oxide is studied, as a step of the head-end of the fuel reprocessing. An extensive bibliography was analysed, concerning the main aspects of the system, specially the most important process variables. Proposed mechanisms and models for the thorium oxide dissolution are presented. The laboratory tests were performed in two phases: at first, powdered thoria was used as the material to be dissolved. The objective was to know how changes in the concentrations of the dissolvent solution components HNO_3, HF and $Al(NO_3)_3$ affect the dissolution rate. The tests were planned according to the fractional factorial method. These results showed that it is advantageous to work with powdered material, since the reaction occurs rapidly. And, if the Thorex solution (HNO_3 13M, HF 0.05M and $Al(NO_3)_3$ 0.10M) is a suitable dissolvent, it was verified that it is possible to reduce the concentration of either nitric or fluoridric acid, without reducing the reaction rate to an undesirable value. Significant interaction between the components of the dissolvent solution was also observed. In the second phase of the tests, (Th, 5%U)O_2 sintered pellets were used. The main goals were to know the pellets dissolution behaviour and to compare the results for dif-

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ferent pellets among themselves. It was observed that the metallurgical history of the material strongly influences its dissolution, specially the density and the microstructure. How the $(Th,U)O_2$ mass/Thorex solution volume ratio affects the time needed to obtain a 1 M Th/liter solution was also studied. The activation energy for the reaction was obtained.

39678 (OUP—84-05) Construction of a facility for 14 MeV neutron activation analysis of oxygen in aluminium. Bjoernstad, T.; Alstad, J.; Johannesen, T. (Oslo Univ. (Norway). Fysisk Inst.). Feb 1984. 39p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781064.

The article describes the construction and performance of a facility for 14 MeV neutron activation analysis, mainly for oxygen in aluminium, at the University of Oslo. It consists of a sealed tube neutron generator, a biaxial rotation system for samples in irradiation position, a mechanism for automatic separation of sample and container, and appropriate detectors and counting electronics. Especially considered are the procedures for sample preparation and packing, standardization, optimization of the energy range for integration and optimization of the irradiation, decay and counting times. The applicability of the facility is exemplified by analytical results from comparative investigations in different laboratories using different methods.

39679 (RFP—3857) Porous sorbents and membrane supported specific actinide chelators and solvent extractants. Navratil, J.D. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 1985. Contract AC04-76DP03533. 15p. (CONF-8509125—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015256.

From Conference on separation of ionic solutes; Smolenice, Czecholovakia (2 Sep 1985).

The first part of this paper focuses on new catecholamide actinide chelators for application to both biological and environmental decontamination. The investigators have designed a structurally novel system, which they refer to as H-octadentate catecholamide ligands. Each of the points of the H has catechol moiety fixed to it. Synthesis of the catecholamide was designed so as to fix the ligand to a matrix and amend the ligand's geometry to the metal. Data from studies with the octadentate ligand, PLUTO, using synthetic buffered solutions and process waste solutions. Table 4, indicate an overall optimum actinide removal in the pH 6-7 range. The degree of decontamination is similar in that range for both buffered and waste solutions. A decontamination factor of 300 corresponds to 95% of the plutonium removed from solution after only one contact with the loaded resin. Americium removal is overall better from the waste solutions, with optimum removal of 12% to 80% in the pH range 6-7. The second part of this paper deals with multifunctional organophosphorus solvent extractants, such as octylphenyl-N,N-diisobutylcarbamoylmethylphosphine oxide and dihexyl-N,N-diethyl-carbamolymethylphosphonate, supported on solid membranes and spherical sorbents. These systems are being tested for plutonium and americium recovery and purification. An overview is presented of recent laboratory and pilot-scale work on the actinide recovery and americium purification processes and associated chemical studies. 6 figs., 4 tabs.

39680 (SAND—85-0592C) Channeling analysis of strain in superlattices. Picraux, S.T.; Chu, W.K.; Allen, W.R.; Ellison, J.A. (Sandia National Labs., Albuquerque, NM (USA); North Carolina Univ., Chapel Hill (USA); New Mexico Univ., Albuquerque (USA)). 1985. Contract AC04-76DP00789. 47p. (CONF-850716—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85014437.

From 7. international conference on ion beam analysis; Berlin, F.R. Germany (7 Jul 1985).

We review recent ion channeling methods for the analysis of the strain in epitaxially grown structures known as strained-layer superlattices (SLSs). These strain measurements have primarily utilized inclined-direction axial dechanneling or angular scans. More recently, a new channeling phenomenon, which involves a resonance between the planar channeling trajectory wavelength and the superlattice period, has been discovered in superlattices. Resonant conditions leading to both catastrophic dechanneling and resonant channeling are demonstrated for inclined planar directions in SLSs. Catastrophic dechanneling is shown to be the most sensitive of the channeling techniques for strain analysis. Comparison with detailed theoretical calculations shows that a simple modified-harmonic model can be used to extract the strain with relatively good accuracy from angular measurements of the catastropic dechanneling.

39681 (TRITA-MEK—84-05) Efficiency of a fluid-fluid centrifugal separation. Apazidis, N. (Royal Inst. of Tech., Stockholm (Sweden). Dept. of Mechanics). May 1984. 38p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781068.

Efficiency of a separation process of two immiscible incompressible fluids of different densities occurring under the influence of a combined centrifugal and gravitational force field is investigated. The analysis is based on the set of equations for a rotating two-phase flow of a mixture as presented by Greenspan (1983). The geometry of the separation process is considered and the total flow of the separated phases evaluated.

39682 Millimeter-wave detection of free radicals using pulsed laser photolysis. Kolbe, W.F.; Leskovar, B. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Review of Scientific Instruments;* **56**: No. 8, 1577-1581(Aug 1985). Contract AC03-76SF00098.

The application of millimeter-wave microwave spectroscopy to the detection of free radicals and other species generated by pulsed excimer laser photolysis is described. To detect the radical species, a newly developed 140-GHz microwave spectrometer employing a high-Q Fabry—Perot cavity was used. The technique is illustrated by the observation of SO and CS radicals produced by photodissociation at 193 nm of SO_2 and CS_2, respectively. SO absorption signals from the ground vibrational state transition at 138.17 GHz and the first and second excited vibrational state transitions at 137.28 and 136.45 GHz were measured. CS was detected in several excited vibrational states up to $v = 4$. Finally, as an example of the application of the technique to chemical kinetic studies, the reaction rate of SO with NO_2 was determined. The measured rate coefficient at 298 K of $(1.46 +- 0.12) \times 10^{-11}$ cm^3 molecule^{-1} s^{-1} is in excellent agreement with values reported in other studies. Millimeter-wave spectroscopy is shown to be a sensitive and highly specific probe for the detection of short lived species in gas phase chemical kinetic studies.

39683 (NE-F—11-2T-Rev.-3-85) Analytical chemistry methods for boron carbide absorber material. Revision March 1985. (Hanford Engineering Development Lab., Richland, WA (USA)). 29 May 1985. Contract AC06-76FF02170. 39p. Nuclear Standards Management Center, P.O. Box Y, Oak Ridge, TN 37831. File Number TI85013576.

39684 Lens and Wedge Absorption Cells for FT-IR spectroscopy. Hirschfeld, T. (Lawrence Livermore Laboratory, Livermore, California 94550). *Applied Spectroscopy;* **39**: No. 3, 426-430(May 1985).

New cell geometries for extending the dynamic range of FT-IR absorption spectroscopy are described. These are variants of the stepped multiple thickness cells described before, in which the cell thickness varies continuously with location. Either homogeneous wedge or lenslike cells are used. The resulting distortion of the cell's photometric linearity can be straightened out computationally. However, the change in the measured energy levels drastically increases the dynamic range of the measurement for a given tolerable relative error in absorbance. The theoretical behavior of the cells is analyzed, and their photometric distortion and dynamic range calculated. The experimental realization of one of them is used to show the usefulness and limitations of the procedure.

39685 Optimization of sample absorbance for quantitative analysis in the presence of pathlength error in the IR and NIR regions. Hirschfeld, T.; Honigs, D.; Hieftje, G. (Lawrence Livermore National Laboratory, Livermore, California 94550 (T.H.); and Indiana University, Bloomington, Indiana 47405 (D.H., G.H)). *Applied Spectroscopy;* **39**: No. 3, 430-433(May 1985).

Optical absorbance levels for quantiative analysis in the presence of photometric error have been described in the past. In

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newer instrumentation, such as FT-IR and NIRA spectrometers, the photometric error is no longer limiting. In these instruments, pathlength error due to cell or sampling irreproducibility is often a major concern. One can derive optimal absorbance by taking both pathlength and photometric errors into account. This paper analyzes the cases of pathlength error >> photometric error (trivial) and various cases in which the pathlength errors and the photometric error are of the same order: adjustable concentration (trivial until dilution errors are considered), constant relative pathlength error (trivial), and constant absolute pathlength error. The latter, in particular, is analyzed in detail to give the behavior of the error, the behavior of the optimal absorbance in its presence, and the total error levels attainable.

39686 **Gas chromatography/mass spectrometry determination of water-soluble primary amines as their pentafluorobenzaldehyde imines.** Avery, M.J.; Junk, G.A. (Ames Lab., IA). *Analytical Chemistry;* **57**: No. 4, 790-792(Apr 1985). Contract W-7405-ENG-82.

Primary aliphatic amines present at trace levels in water samples were converted to imine derivatives using pentafluorobenzaldehyde. The derivatives were extracted into hexane and measured by combined high-resolution gas chromatography/mass spectrometry using multiple ion monitoring. The detection limit of this method for determining amines was 10 ppb for 0.5-mL samples of tap, river, and oil shale process waters. 16 references, 1 table, 4 figures.

39687 **X-ray fluorescent determination of uranium in the gaseous phase.** Close, D.A.; Pratt, J.C.; Malanify, J.J.; Atwater, H.F. (Los Alamos National Lab., NM (USA)). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **234**: No. 3, 556-561(15 Feb 1985).

The pressure of uranium in gaseous UF_6 inside a cylinder can be measured using X-ray fluorescence. A highly collimated source, highly collimated detector, and a very rigid geometry are required. This measurement technique is independent of the deposit that forms on the inside wall of the cylinder due to chemical reactions of UF_6 gas with impurities. The technique is applicable for gaseous UF_6 at low pressures where other techniques fail. The detectability limit, assuming a 25 mCi ^{57}Co fluorescing source, is less than 1 Torr gas pressure in a 30 min count time.

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REFER ALSO TO CITATION(S) 39559, 39703

39688 **(LA-UR—85-2358) Absorption spectra of shocked liquid CS_2.** Dallman, J.C. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 6p. (CONF-850736—47). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015675.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

The importance of shock initiation of high explosives (HE) was understood as early as 1863 when Alfred Nobel introduced the detonator as a means of detonating nitroglycerine. The critical pressure rise times required to achieve shock initiation and steady propagation of detonation are determined by the chemical and mechanical properties of an explosive. Although progress has been made in the understanding of the effects of mechanical properties, the detailed effects of high pressures on chemical reaction mechanisms are still only poorly understood. This paper reports the results of two experiments using CS_2, which is known to undergo electronic state transitions when shocked to high pressures. The goal of these experiments was to examine the known shock-generated expansion of CS_2 absorption bands while generating the shocks with a flyer plate system driven by high explosives.

39689 **(NUCLEBRAS-CDTN—479) Evaluation of two processes for the production of phosphoric acid in pilot scale.** Santos Benedetto, J. dos. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). 1984. 24p. (In Portuguese). (CONF-8405314—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781081.

From 10. Brazilian meeting on ore treatment and hydrometallurgy; Belo Horizonte, MG, Brazil (23 May 1984).

Two processes for the production of phosphoric acid, based on dihydrate route and hemihydrate route, have been evaluated. The processes were tested in a pilot plant using the concentrate obtained from phosphorus-uraniferous mineral from Itataia mines (CE, Brazil). Results were evaluated from the data obtained from phosphorus and uranium solubilizations. Also presented, although in a summarised way, are the description of the construction of the pilot plants and the analytical methods for the follow-up of processes.

39690 **Adsorbed polymers under flow. A stochastic dynamical system approach.** Armstrong, R.; Jhon, M.S. (Sandia National Laboratories, Livermore, California 94550). *Journal of Chemical Physics;* **83**: No. 5, 2475-2481(1 Sep 1985).

Recent experiments have shown that porous filters preadsorbed with polymer molecules exhibit an anomalously high pressure drop at high rates of flow. We have modeled the adsorbed polymers as dynamical systems and have found that the introduction of hydrodynamic interaction between molecules destabilizes at a high applied shear. As a direct result this instability will cause the molecules to unravel and stretch far into the cross section of the pore, and thus by inference, cause the observed anomalously high pressure drop. Although much of this paper is devoted to the stability characteristics of the deterministic system, Brownian motion is also considered, and an account of the statistics of the Brownian system when the deterministic system becomes unstable is given. The examples revealed in this paper are not *f sufficient complexity to calculate with any accuracy the magnitude of this anomalous pressure drop. We simply present a procedure by which a large variety of more complex models could be undertaken and their ultimate effect clearly understood.

39691 **Effect of J dependence of Raman cross sections on CARS product quantum state distributions for the $H+D_2 \rightarrow HD+D$ reaction.** Veirs, D.K.; Rosenblatt, G.M.; Valentini, J.J. (Chemistry Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **83**: No. 4, 1605-1608(15 Aug 1985).

HD product quantum state distributions are recalculated for published CARS measurements using J-dependent Raman cross sections determined from accurate, ab initio calculations. The use of J-dependent cross sections lowers calculated number densities by 5%—10% at high J and therefore systematically shifts the relative product-state distribution somewhat from high J to low J. This shift does not noticeably affect discrepancies between CARS results and multiphoton ionization experiments on the same reaction. The results indicate that J-dependent Raman cross sections should be used in reducing vibrational Q-branch CARS and other Raman data for molecular hydrogen and its isotopes.

4003 Organic Chemistry

REFER ALSO TO CITATION(S) 38687, 38689, 38690, 38704, 38707, 38787, 38960, 39686, 39702

39692 **(BARC—1226) Preparation of polymeric deuterium containing compounds.** Kunjappu, J.T.; Rao, K.N. (Bhabha Atomic Research Centre, Bombay (India)). 1984. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781070.

Methods for preparing deuterium containing polymers are discussed. Relative merits of each method are brought forth. Experimental conditions for its preparation from deuterodiazomethane are described. Also, the syntheses of various deutero intermediates like perdeuteroacetyl methyl urea and perdeuteronitrosomethyl urea are incorporated. The methods used for estimating the deuterium content in the various deutero compounds are described.

39693 **(DOE/PC/60804—T7) Thermophysical properties correlations and pseudocomponent characterization parameter estimation for fossil fluids. Third quarterly report (II year), March 1-May 31, 1985.** Starling, K.E.; Lee, L.L.; Ellington, R.T.; Watanasiri, S.; Khan, M.A.; Langenberg, M.A.; Mannan, M.; Sheth, K. (Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science). 1985. Contract FG22-83PC60804. 20p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014042.

This report summarizes work performed during the period March 1, 1985 and May 31, 1985. During this quarter, the correlation work for dilute gas thermal conductivity was completed. The correlation was applied to 12 nonpolar and 7 polar and associating compounds. A comparison with the 5-parameter Chung-Lee-Starling (CLS) dilute gas thermal conductivity correlation shows that for the 12 nonpolar substances studied, the present correlation yields better results than the CLS correlation. Though, the results obtained by applying the current correlation to polar and associating substances indicate slightly higher deviations, the predictions are still within the range of experimental uncertainty of the data. 25 refs., 4 figs., 3 tabs.

39694 **(RAL—84-121) Evidence for a triple-bond muonium adduct.** Cox, S.F.J.; Fischer, H.; Roduner, E.; Symons, M.C.R. (Rutherford Appleton Lab., Chilton (UK)). Nov 1984. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701740.

Submitted for publication to Chemical Physics Letters.

The isotopically substituted phenyl-vinyl radicals, Ph(dC/dt) = CHMu and Ph(dC/dt) = CDMu have been identified in a μSR study of liquid phenyl acetylene and phenyl-d_1-acetylene. Formal addition of muonium at the triple bond is thereby established. The point of addition is determined to be the terminal carbon atom. The structural information is consistent with that obtained from ESR studies of the radical (dC/dt) = CH_2. Three other radicals are also observed; these are tentatively assigned as three of the four possible ring adducts, $(dC/dt)_8H_5Mu.C = CH$.

39695 **(SAND—85-0383C) Subthreshold generation of free radicals in shock-loaded organic solids.** Dodson, B.W.; Venturini, E.L.; Rogers, J.W. Jr. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 6p. (CONF-850736—38). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015143.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

The mechanisms through which a shock wave can induce chemical reactivity are currently unknown in any detail. However, there does exist some evidence and considerable speculation that generation of free radicals in the passage of the shock wave may be an important step in many shock-induced reaction mechanisms. We have demonstrated that substantial densities of active molecular species are formed by subthreshold shock loading of organic compounds. The generation of such active centers may be of great importance for the shock-induced reactivity observed in large classes of organics. In most cases, however, it would seem that topochemical and other factors inhibit a reaction from taking place merely in the presence of such defects. In such cases, we suggest that the generation of active species, which can take place at rather low stresses, is necessary but not sufficent to initiate a large-scale chemical reaction. An additional factor which would play a major role in overcoming such topochemical and other structural restraints is a shear-driven molecular transport mechanism which would become important in organic compounds in the 10-20 GPa(Cu) region. The details of such a mechanism are currently unknown, but evidence of its importance does exist. In any case, shock-induced chemical reactions in organics seem to be multi-step processes, starting with generation of active centers and proceeding via currently unidentified mechanisms, among which may be shear-driven molecular transport, to a significant product yield. 11 refs., 1 tab.

39696 **Rate constants for the reaction of hydroxyl radicals with acetaldehyde from 244—528 K.** Michael, J.V.; Keil, D.G.; Klemm, R.B. (Department of Applied Science, Brookhaven National Laboratory, Upton, New York 11973). *Journal of Chemical Physics;* 83: No. 4, 1630-1636(15 Aug 1985). Contract AC02-76CH00016.

The rate constant for the reaction of hydroxyl radical with acetaldehyde $OH + CH_3CHO \rightarrow$ products has been measured from 244—528 K with the discharge flow-resonance fluorescence technique. The temperature dependence, expressed in Arrhenius form, is $k_1(T) = (5.52 +- 0.80) \times 10^{-12} \exp(610 +- 103/RT)$ cm^3 $molecule^{-1}$ s^{-1}, where R is in cal mol^{-1} and the errors are at the two standard deviation level. This result is compared to earlier flash photolysis-resonance fluorescence work. Mechanistic considerations are additionally discussed, and it is concluded that acetyl radicals are the most probable products of the reaction. Lastly, theoretical calculations are presented which delineate theoretical issues to be addressed in ab initio potential energy calculations.

4004 Electrochemistry

REFER ALSO TO CITATION(S) 39555

39697 **(CONF-8504153—1) Fractal model for charge diffusion across a rough interface.** Gray, L.J.; Liu, S.H.; Kaplan, T. (Oak Ridge National Lab., TN (USA)). Mar 1985. Contract AC05-84OR21400. 6p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85011432.

From NATO advanced studies conference on scaling phenomena in disordered systems; Geilo, Norway (10 Apr 1985).

Charge transfer across the interface between an electrode and an electrolyte is considered. A fractal (grooved) structure model is examined and found to exhibit the experimentally observed behavior. In a real material, the rough interface is actually a disordered structure. The fractal dimension of the random surface is calculated. (DLC)

4005 Photochemistry

REFER ALSO TO CITATION(S) 40118

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 38841, 40261

39698 **(JAERI-M—83-126) Irradiation effect on the reaction of mixture of carbon monoxide and hydrogen, (3). Radiation chemical reaction at elevated pressure under gas circulation.** Sugimoto, Shun-ichi; Nishii, Masanobu. (Japan Atomic Energy Research Inst., Tokyo). Aug 1983. 118p. (In Japanese). NTIS (US Sales Only), PC A06/MF A01. File Number DE85701606.

A series of our studies on radiation chemical reaction of CO and H_2 mixture indicated that several organic compounds were produced by electron beam irradiation and the amounts of the products increase with increasing pressure and also increased when the irradiation was carried out under circulation. The present study was carried out in an attempt to investigate whether the amounts of the products increase when the mixture is irradiated under circulation at elevated pressure. For this purpose, a reaction apparatus, which can irradiated the mixture up to 10,000 Torr under circulation, was built and the experiments were carried out on the amounts of products as functions of pressure, irradiation time, gas composition, temperature and dose rate. G values of most compounds were found to increase with increasing pressure under circulation. Among the products, the reaction conditions giving high yield of acetaldehyde were studied in detail, since this compound is considered to be one of the most important intermediate compounds in C_1 chemistry. The maximum G value of acetaldehyde was 2.9 which was obtained at 8,000 Torr, 55 CO mol%, 2×10^{19} $eV.g^{-1}.sec^{-1}$, 1.3×10^{20} $eV.g^{-1}$ and 22 °C. The selectivity favored this compounds in all organic compounds was 57 mol% at the conversion rate of 0.8 %. In order to elucidate the reaction paths of formation and disappear-

ance of acetaldehyde, the amounts of products were determined for the mixture with or without the presence of small amounts of acetadehyde.

39699 (JAERI-M—83-199) Annual report of the Osaka Laboratory for Radiation Chemistry Japan Atomic Energy Research Institute (No. 16). April 1, 1982-March 31, 1983. (Japan Atomic Energy Research Inst., Tokyo). Nov 1983. 88p. NTIS (US Sales Only), PC A05/MF A01. File Number DE85701607.

This report describes research activities of Osaka Laboratory for Radiation Chemistry, JAERI during one year period from April 1, 1982 through March 31, 1983. The latest report, for 1982, is JAERI-M 82-192. Detailed descriptions of the activities are presented in the following subjects: studies on reactions of carbon monoxide, water and methane; polymerization under the irradiation of high dose rate electron beams; modification of polymers, degradation, cross-linking, and grafting.

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 38867, 39879, 40257, 40309, 40791

39700 (AERE-R—11391) Determination of the solubilities and degrees of sorption of uranium, plutonium, americium and neptunium under near-field conditions for disposal. Pryke, D.C.; Rees, J.H.; Streeton, R.J.W. (UKAEA Atomic Energy Research Establishment, Harwell. Chemical Technology Div.). Oct 1984. 10p. HMSO, London, price Pound 4.00.

Solubilities of uranium, plutonium, neptunium and americium have been measured in water that had previously been equilibrated with two candidate matrices for immobilisation, one cement and a polymer. The effect on solubilities of two species usually found in groundwaters, carbonate and sulphate, appears to be small, except in the case of uranium and carbonate, where solubility increases. Sorption of actinides on crushed cement was found to be extensive, and was generally higher than with the polymer, particularly when the latter was in the form of a monolith. For disposal of intermediate level wastes, sorption could keep equilibrium levels of actinides in a repository below solubility limits when cement is present. The results presented here have been used to calculate equilibrium positions for Magnox cladding wastes in disposal, as discussed in the accompanying paper.

39701 (IAEA-R—2886-F) Production of short-lived radiopharmaceuticals with CV-28 cyclotron. Final report for the period 1 June 1981-14 July 1984. Gerbasi da Silva, A. (International Atomic Energy Agency, Vienna (Austria)). Jan 1985. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701603.

A variable energy isochronous cyclotron CV-28 at the Physical Department of the Instituto de Engenharia Nuclear in Rio de Janeiro, Brazil, is used for radionuclide production of medical interest. The production methods of ^{67}Ga, ^{77}Br, ^{111}In, ^{123}I, ^{201}Tb and their corresponding radiopharmaceuticals were developed. The radiopharmaceuticals ^{77}Br-bromophenol, ^{77}Br-rose bengal, ^{123}I-hippuric acid, ^{123}I-rose bengal, ^{111}In-EDTA, ^{111}In-DTPA and ^{111}In-citrate were under routine production. Their labelling yields were 96%, 82%, 96%, 82%, 89+-6%, 92+-4% and 100+-25%, respectively. The labelling yield and purity were determined using thin layer and paper chromatography. Bio-distribution studies in experimental animals have shown the good quality of these compounds.

39702 (IFE/KR/E—83/005) ^{131}I-3-iodobenzylguanidine (^{131}I-3-IBG) as a scintigraphic agent for the visualization of adrenal medulla tumors. Heggeli, D.E.; Brorson, B.I.; Bremper, P.O. (Institute for Energy Technology, Kjeller (Norway)). Jun 1983. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781072.

A method of labelling 3-iodobenzylguanidine with ^{131}I is described. 3-IBG . 0.5 H_2SO_4 and Cu(II)SO_4 were dissolved in a 0.1 M NH_4PO_4 buffer and mixed with ^{131}I-NaI. The solution was evaporated to dryness by heating. After addition of water, the solution was heated with reflux for two hours. The I^- ions were removed after labelling by anionic exchange chromatography. The final product was made isotonic and bacteriostatic by the addition of acetate buffer, saline and benzylalcohol. The product was filtered through a membrane filter with a pore size of 0.22*my*m and was apyrogenically tested by limulus test. The tumors of adrenal medulla, pheochromocytomas and neuroplastomas may in some cases be small or located extra-adrenally. In those cases ^{131}I-labelled 3-IBG is a valuable tool, since 3-IBG concentrates in adrenal medulla tumors because ot its analogy to the catecholamines. Injecting a dose of 0.5 mCi ^{131}I-3-IBG (2.5 mCi/mg), which is an adult dose, allows the scintigraphic localization of the tumours, thus guiding the surgeon. Adrenal uptake in mice and dog is described in the report, as well as a rapid method for the control of radiochemical purity. The radioactive concentration of the ^{131}I-3-IBG has been found to be important for the radiochemical stability of the product.

39703 (INIS-mf—9266) Studies on the vapour phase hydrolysis of some lanthanide and actinide (III) bromides. Gueldner, R. (Muenchen Univ. (Germany, F.R.). Fakultaet fuer Chemie und Pharmazie). 10 Feb 1981. 100p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE85780896.

The equilibrium constants of the vapour phase hydrolysis of actinide and lanthanide bromides were determined for different temperature levels. The tribromides are hydrolyzed into oxide bromides while releasing hydrogen bromide. The equilibrium constants of neodymium, gadolinium, americium, praseodymium and plutonium tribromides were determined by analyzing the gas mixture and measuring the partial pressures.

39704 (JAERI-M—83-124) Laser spectroscopy of U and UF_6. Arisawa, Takashi; Maruyama, Yoichiro; Suzuki, Yoji; Kato, Masaaki; Naruse, Yuji. (Japan Atomic Energy Research Inst., Tokyo). Aug 1983. 34p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701604.

In the laser isotope speparation method, uranium atoms or molecules, usually UF_6, are excited by a laser beam with a wavelength tunability and narrow linewidth, before they are fixed by an appropriate procedure. Therefore it is important to know the basic laser photo-excitation process. From this point of view, spectroscopic studies were performed for uranium atom (U) and molecule (UF_6). Highly resolved fluorescence and absorption spectra of U were obtained mainly for the energy level of 16900 cm^{-1} by vaporizing uranium metal, producing an atomic beam and irradiating it with a narrow bandwidth laser beam. From these spectra, the isotope shift, the hyperfine structure and the photo-absorption cross section were obtained. And using a pulsed laser beam source, lifetimes of excited states of uranium atoms were measured. Vibrational and vibronic states of UF_6 were also studied using a solid film of pure UF_6 or a mixture of UF_6 and buffer gas formed on a cold plate. Using a Raman spectroscopy, it was revealed that a peak of a vibrational spectrum is slightly influenced by the concentration of the buffer gas added in UF_6. From the measurement of the absorption and the fluorescence spectrum for the X-A tilde transition, some progressions of the vibrational modes were observed.

39705 (JAERI-M—83-168) High accuracy measurements of bulk densities of ThO_2 and (Th, U)O_2 microspheres by mercury pycnometry. Yamagishi, Shigeru; Takahashi, Yoshihisa; Shiba, Koreyuki. (Japan Atomic Energy Research Inst., Tokyo). Oct 1983. 24p. (In Japanese). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701599.

To determine accurate volumes of granular samples by mercury pycnometry, a special pycnometer was designed and made of glass. It has only one narrow inlet and no taper-joint portion which introduces a main error into measurements by using ordinary pycnometers. In addition, the position of mercury surface at the narrow inlet was precisely observed by a microscope and corrections of mercury weight were made for the surface deviation from the standard. The above improvements decreased the error in volume measurements to 0.0001 cm^3; bulk densities of ThO_2 and (Th, U)O_2 microspheres were determined within an error of 0.01 g/cm^3 for samples of 1.5 g. Such accurate measurements gave interesting information about the microsphere-density variation in pro-

duction batches which depended on relative density of the microspheres.

39706 (OUP—83-1) Production of ^{67}Ga at the Oslo Cyclotron. Bjoernstad, T.; Holtebekk, T. (Oslo Univ. (Norway). Fysisk Inst.). Jan 1983. 29p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781073.

A method for production of ^{67}Ga at the Oslo Cyclotron is described. The method is based on the nuclear reaction ^{68}Zn (p,2n)^{67}Ga. The target is natural zinc metal of thickness 1.3 mm fixed by a thin alloy layer to a copper disc for efficient cooling during irradiation. By applying a beam of 29 MeV protons, a maximum production yield of approx. 1.8 mCi/*my*Ah was obtained. By demanding a contamination level of ^{66}Ga <= 1%, the "useful" yield after a decaytime of 88 h is approx. 0.8 mCi/*my*Ah. Gallium has been separated carrierfree from the zinc matrix by cation exchange from 7.5M hydrocloric acid solutions and prepared as citrate complex at pH 5.5. After sterile filtering, autoclavation, pyrogene testing and analysis for iron and zinc, the ^{67}Ga-radiopharmaceutical has been applied in human investigations at the Ullevaal hospital in Oslo.

39707 (OUP—84-02) Production of /sup 81m/Kr generators at the Oslo cyclotron. Bjroenstad, T.; Holtebekk, T.; Ruud, A. (Oslo Univ. (Norway). Fysisk Inst.). Jan 1984. 31p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781074.

The techniques developed for the production of /sup 81m/Kr(13s) ventilation generators at the Oslo cyclotron are described. The procedure is based on the reaction ^{82}Kr(p,2n)^{81}Ru using krypton gas of natural composition as target. The target chamber is designed for a gas pressure of 10 bar. The production unit is dimensioned for a parallel production of five generators, but this number may easily be increased. Attention is drawn to the fact that /sup 81m/Rb(31 min) is produced in about the same amount as the ^{81}Rb (4.57 h) ground state. The consequences for the calibration procedure is discussed. Routine production has been exerted without major difficulties for nearly 1.5 years. The procedure has proven to be inexpensive and reliable.

39708 Myocardial imaging agents: synthesis, characterization, and evaluation of (Z)- and (Z,E)-18-^{82}Brbromo-5-tellura-17-octadecenoic acids. Srivastava, P.C.; Knapp, F.F. Jr.; Callahan, A.P.; Owen, B.A.; Kabalka, G.W.; Sastry, K.A. (Oak Ridge National Lab., TN). *Journal of Medicinal Chemistry;* **28**: No. 4, 408-412(Apr 1985).

The effects of replacement of radioiodide with radiobromide on the biological properties of a model vinyl halide substituted tellurium fatty acid have been evaluated. The use of a facile radiobromination method involving the reaction of [^{82}Br]Br_2 with vinylmercuric bromide substrates has been investigated. Unexpectedly, both the cis- and trans- vinyl bromide products are formed as confirmed by chromatographic and spectral studies. With use of this technique, (E,Z)-1-[^{82}Br]bromo-13- iodo-1-tridecene was prepared and used as the substrate to prepare (E,Z)- 18-[^{82}Br]bromo-5-tellura-17-octadecenoic acid (13-E,Z), which was evaluated in rats. Both [^{82}Br]-13-E,Z and [^{82}Br]-13-Z, prepared by an established procedure using N-chorosuccinimide-Br- reaction with the trans-boronovinyl substrates, showed tissue distribution properties similar to those of (E)-18-[^{125}I]iodo-5-tellura-17-octadecenoic acid. These results demonstrate that replacement of I with Br and also the stereochemistry about the olefinic bond do not drastically affect heart uptake and retention.

4008 Combustion, Pyrolysis, And High-temperature Chemistry

REFER ALSO TO CITATION(S) 38724, 39364, 39785

39709 (DOE/ER/10372—T1) Laser fluorescence studies of the detailed flame chemistry of nitrogen, sulfur, and carbon. Final technical report, March 1, 1982-May 31, 1983. Schofield, K.; Steinberg, M. (California Univ., Santa Barbara (USA). Quantum Inst.). 1984. Contract AT03-79ER10372. 28p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015499.

Measurement of laser induced fluorescence and temperature profiles in a series of lean and rich $H_2/O_2/N_2$ flames with and without added sulfur along with similar measurements in some rich $C_2H_2/O_2/N_2$ flames have provided a broad data base for the identification and quantification of the radical recombination chemistry in these systems. A program has been developed to analyze the data. This report centers on that analysis in the lean and rich sulfur free $H_2/O_2/N_2$ flames. 37 refs., 8 figs., 2 tabs.

39710 (N—85-21162) Comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations. Radhakrishnan, K. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1984. 18p. (NASA-TM—83590; E—1988). NTIS, PC A02/MF A01.

A comparison of the efficiency of several algorithms recently developed for the efficient numerical integration of stiff ordinary differential equations is presented. The methods examined include two general-purpose codes EPISODE and LSODE and three codes (CHEMEQ, CREK1D, and GCKP84) developed specifically to integrate chemical kinetic rate equations. The codes are applied to two test problems drawn from combustion kinetics. The comparisons show that LSODE is the fastest code currently available for the integration of combustion kinetic rate equations. An important finding is that an iterative solution of the algebraic energy conservation equation to compute the temperature can be more efficient than evaluating the temperature by integrating its time-derivative.

39711 (N—85-21282) Coupling of an anchored flame with an acoustic field. Mcintosh, A.C. (Cranfield Inst. of Tech., Bedford (UK)). Oct 1984. 24p. NTIS, PC A02/MF A01.

The interaction of an anchored flame with a low-level acoustic field is considered. The flame is considered to be held by a gauze through which the reactants are allowed to flow. Small perturbations in velocity in the combustion zone are linked upstream and downstream with order O(M) acoustic disturbances at large distances from the source, (where M is the flow Mach number). This matching process yields a frequency condition governing the flame vibration and preliminary results for emitted acoustic waves are presented.

39712 (N—85-21283) Behavior of the lean methane-air flame at zero-gravity. Final report, November 1983-December 1984. Noe, K.A.; Strehlow, R.A. (Illinois Univ., Urbana (USA)). Feb 1985. 48p. (NASA-CR—175586). NTIS, PC A03/MF A01.

A special rig was designed and constructed to be compatible with the NASA Lewis Research Center Airborne Research Laboratory to allow the study of the effect of gravity on the behavior of lean limit in a standard 50.4 mm (2 in.) internal diameter tube when the mixtures are ignited at the open end and propagate towards the closed end of the tube. The lean limit at zero gravity was found to be 5.10% methane and the flame was found to extenguish in a manner previously observed for downward propagating flames at one g. It was observed that g-jitter could be maintained at less than + or 0.04 g on most zero g trajectories. All of propagating lean limit flames were found to be sporadically cellularly unstable at zero g. There was no observable correlation between the occurrence of g-jitter and the lean limit, average propagation speed of the flame through the tube or the occurrence of cellular instability.

42 ENGINEERING

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 38684, 38685, 38834, 38843, 38860, 38922, 39106, 39240, 39499, 39768, 39779, 39783, 39794, 39883, 40897, 40898

39713 (BDX—613-3281) Study of process variables for flat cable covercoat lamination. Stein, J.D.; Fossey, D.J. (Allied Corp., Kansas City, MO (USA). Bendix Kansas City Div.). Jul 1985. Contract AC04-76DP00613. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014698.

Press lamination of Kapton covercoat for flat flex cables requires the specification of limits for many variables. Correlation of these variables to product performance can be difficult. Traditional peel strength tests and product functional tests are helpful; however, many samples are required to establish confidence that a process change is significant. An experiment was conducted to determine the effect of eight process variables: material supplier, adhesive thickness, size, humidity, lamination pressure, lay-up method, press cycle, and circuit pattern. Samples were subjected to elevated temperature within a vacuum and the temperature at which delamination occurred was used as the experimental response. The presence of a circuit pattern was found to be the only significant variable for covercoat lamination. The base laminate consisting of copper/Kapton/copper was found to vary with supplier and one roll-laminated material was improved with press lamination pressure and lay-up method. The screening experiment provides a basis for continued evaluation of suppliers for the Kapton-acrylic adhesive system. The significant circuit pattern effect provides a basis for investigation of circuit panel designs that facilitate air removal. Panel designs that include borders of copper can be tested with bleeded channels within the borders included as part of the design.

39714 **(BHRA—85/33/XAB) Pneumatic conveying activities.** Baker, P.J. (British Hydromechanics Research Association, Cranfield). Jul 1982. 57p. (RR—1871). NTIS, PC $30.00/MF $30.00.

The British Hydromechanics Research Association (BHRA) became active in pneumatic conveying during 1979, and acquired a large pneumatic conveying test facility. During late 1980 a study was undertaken on the problems of distribution and deposition of fine pulverised coal in the conveying pipes between coal mills and burners of direct-firing systems. By 1981, preparations were in hand for testing granular sodium carbonate, a difficult material, in the pneumatic conveying facility, and subjects had been identified for future consortium project proposals.

39715 **(CEGB-TPRD/B—0442/N84) Factors influencing the design and assessment of elastomer seals for Nuclear Fuel Transport Flasks.** Chivers, T.C.; George, A.F. (Central Electricity Generating Board, Berkeley (UK). Berkeley Nuclear Labs.). Jun 1984. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701882.

Elastomeric seals offer considerable advantages in the achievement of high integrity sealing. This report discusses the factors limiting the performance of elastomers under fault conditions, with particular attention to Nuclear Fuel Transport Flask seals. There is emphasis on seal compression and its optimisation, so that it is high enough to ensure adequate surface roughness infilling, and low enough to avoid damaging tensile stresses. The assessment of seal performance is discussed, and includes consideration of pressure actuation and extrusion, permeation losses and rig testing. It is concluded that to reach a satisfactory design requires considerable information on different aspects of elastomeric performance.

39716 **(CONF-8504132—1) Power and signal transmission for mobile teleoperated systems.** Morris, A.C. Jr.; Hamel, W.R. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 31p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85013994.

From Japan/United States specialist meeting on remote systems technology; Oak Ridge, TN, USA (26 Apr 1985).

Appropriate means must be furnished for supplying power and for sending controlling commands to mobile teleoperated systems. Because a sizable number of possibilities are available for such applications, methods used in designing both the power and communications systems built into mobile vehicles that serve in radiological emergencies must be carefully selected. This paper describes a number of umbilical, on-board, and wireless systems used in tranmitting power that are available for mobile teleoperator services. The pros and cons of selecting appropriate methods from a list of possible communication systems (wired, fiber optic, and radio frequency) are also examined. Moreover, hybrid systems combining wireless power transmissions with command-information signals are also possible.

39717 **(CONF-8506148—1) Human-machine interface in mobile teleoperators.** Draper, J.V. (Clarke Ambrose, Inc., Knoxville, TN (USA)). 1985. Contract AC05-84OR21400. 15p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85013639.

From Workshop on requirements of mobile teleoperators for radiological emergency response and recovery; Dallas, TX, USA (23 Jun 1985).

39718 **(EGG-M—08685) FAST goes underground.** Fridlund, P.S. (EG and G Idaho, Inc., Idaho Falls (USA)). 1985. Contract AC07-76ID01570. 13p. (CONF-8505181—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85009830.

From 7. annual international ISPA conference; Orlando, FL, USA (7 May 1985).

The FAST-M Cost Estimating Model is a parametric model designed to determine the costs associated with mining and subterranean operations. It is part of the FAST (Freiman Analysis of Systems Techniques) series of parametric models developed by Freiman Parametric Systems, Inc. The rising cost of fossil fuels has created a need for a method which could be used to determine and control costs in mining and subterranean operations. FAST-M fills this need and also provides scheduling information. The model works equally well for a variety of situations including underground vaults for hazardous waste storage, highway tunnels, and mass transit tunnels. In addition, costs for above ground structures and equipment can be calculated. The input for the model may be on a macro or a micro level. This allows the model to be used at various stages in a project. On the macro level, only general conditions and specifications need to be known. On the micro level, the smallest details may be included. As with other FAST models, reference cases are used to more accurately predict costs and scheduling. This paper will address how the model can be used for a variety of subterranean purposes.

39719 **(FEI—1437) Cryostat for neutron studies of superfluid helium under a pressure up to 25 atm.** Puchkov, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1983. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701766.

The design of a cryostat enabling superfluid helium to be investigated under a pressure up to 2.5 atm by neutron methods is presented. The cryostat design is simple and reliable The accuracy of maintaining the sample temperature makes up +-0.01 K that of maintaining the pressure is +-0.05 atm. The flow of rate liquid nitrogen is 0.5 l/h, that of liquid helium is 0.35 l/h. The volume of the liquid helium sample equals 2.6 l. 5 references, 3 figures.

39720 **(GEPP-TM—904) CADCAM integration: test data and product definition data exchange. Pilot project Nos. 4 and 5.** McCauley, V.L. (General Electric Co., Largo, FL (USA). Neutron Devices Dept.). 19 Jun 1985. Contract AC04-76DP00656. 39p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85014848.

Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) integration in the Department of Energy Nuclear Weapons Complex (DOE NWC) requires automating the transfer of data. Two pilot projects were established to initiate meaningful electronic, graphic, and alpha-number data exchange between Sandia National Laboratories, Albuquerque (SNLA), and the General Electric Neutron Devices Department (GEND), and to test the available communication paths. The two projects are described herein and are Pilot Project No. 4, Design Definition Phase, and Pilot Project No. 5, Test Data Phase. Each pilot project is discussed in a separate section of this report. Each section begins with a description of the project objectives and includes the approach used, evaluation criteria, specific issues, and conclusions.

39721 (IFVE-OEF—83-131) Discrete liquid helium level indicator. Lavrent'ev, V.I.; Churakov, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1983. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701767.

Characteristics of liquid helium level indicators produced according to different procedures from carbon-resistors of the Allen-Bredly company are presented. A change in the pick-up signal by 104% is attained during the vapour-liquid interface transition at heat release in liquid Wsub(liq.)not equal to 4.9 mW. The accuracy of the level determination is $\Delta H <= 2$ mm. A six-position liquid helium level indicator enabling to reliably determine the liquid helium level under different operation conditions of the cryostat is described. 8 references, 2 figures, 1 table.

39722 (IFVE-OUNK—83-158) Measurement of stationary heat transfer through insulation of a flat superconducting cable. Bologov, B.D.; Dmitrievskij, Yu.P.; Kozub, S.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1983. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701903.

Three techniques of measuring stationary heat transfer from the surface of a flat transposed cable with a tape insulation are described. The techniques complement and correct each other and made it possible to carry out studies in the region of temperature difference between the sample and boiling helium, 0.01 K - 20 K. Results have been obtained on heat transfer into helium through three types of insulation used in manufacturing superconducting model magnets for the IHEP UNK. Data are also presented on the efficiency of turn-to-turn heat transfer in magnet coils and on the effect of liquid helium flowing under the insulation on nonstationary heat transfer.

39723 (INIS-mf—9573-Vol.2, pp 257-273) Manipulators for radioactive material. Parra Iniguez, A. (Comision Nacional de Seguridad Nuclear y Salvaguardias, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781409.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Remote control instruments and manipulators used for safe handling of low, intermediate and high level radioactive materials are illustrated and described.

39724 (JINR—8-83-717) Technical cryogenic thermometers on the basis of commercial TVO resistors. Datskov, V.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1983. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701769.

The TVO-0.125 domestic commercial composite resistors are suggested to be used as technical cryogenic thermometers in the 4.2-4.50 K range and in magnetic fields up to 8T. The resistor nominal equal to 1 kOhm is chosen as an optimum one for measurements in the 4.2-300 K range. Reproducibility of thermometer calibration as measured periodically during 4 years, makes up approximately 0.02 K (at 4.2 K). The error of thermometer readings in a magnetic field at B=5T (4.2 K) makes up approximately 0.07 K. A calibration formula for operation in the 4.2-300 K range is described. Technique for a preliminary division of the thermometers into groups with equal characteristics is suggested. The results of measuring thermal inertia and heat capacity of the TVO resistor at low temperatures (4-10K) are presented. 11 references, 6 figures, 3 tables.

39725 (JINR—R-8-83-373) Cryogenic current leads with a braiding heat exchanger. Bartenev, V.D.; Datskov, V.I.; Shishov, Yu.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1983. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701768.

High-current (up to 8 kA) cryogenic current leads with a heat-exchanger braiding are developed. The module of a current conducting bus comprises two copper strips and oblate copper braidings placed between them. The butt ends of the strips and braidings are welded to each other thus forming a duct through which the gas, removing the heat from the developed surface of the braidings, flows. Installations for testing the current leads are described. The optimized 1.6 kA current lead has been tested for operation heat. Specific supply into the liquid helium makes up 0.95 W/kA. 8 references, 5 figures.

39726 (LA—10397-MS) Improved quality assurance testing of respirator filters. Soderholm, S.C.; Strandberg, S.W.; Ortiz, L.W.; Nielsen, S.D.; Tillery, M.I.; Gerber, B.V.; Ettinger, H.J. (Los Alamos National Lab., NM (USA)). May 1985. Contract W-7405-ENG-36. 89p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85015360.

The overall objective of this project was to evaluate alternative materials, devices, and procedures that could improve performance test methods for high-efficiency particulate air (HEPA) filters and media and could lead to a new generation of quality assurance (QA) test equipment. Shortcomings of the current QA test equipment and procedures include the use of di-(2-ethylhexyl)phthalate (DEHP), a suspect carcinogen, and ambiguities in particle sizing and penetration measurement. Evaluation of a prototype replacement penetrometer system built for the US Army by A. D. Little, Inc., revealed serious deficiencies in aerosol generation and particle sizing. Studies of chemical degradation in circumstances approximating use conditions and of particle size stability in high-humidity conditions suggested that tetraethylene glycol and oleic acid might be appropriate DEHP substitutes in a new generation of flash vaporization generators of QA test aerosols. The successful completion of this project provided a solid foundation for proceeding in the assembly and testing of improved penetrometers for QA testing of HEPA respirator filters. 109 refs., 20 figs., 13 tabs.

39727 (LA-UR—85-2062) Nearly ideal lens optimization procedure. Brixner, B. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 7p. (CONF-8506142—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014116.

From International lens design conference; Cherry Hill, NJ, USA (10 Jun 1985).

The Brixner lens optimization procedure, in which a lens design moves steadily toward diffraction-limited performance, samples lens performance with bundles of precisely traced skew rays, analyzes performance by calculating the image-spot sizes and positions, and optimizes performance in a least squares system that minimizes the lateral ray deviations from their ideal image points. Minimizing the rms image-spot size minimizes the rms optical path differences (OPDs). Minimizing the rms OPDs also optimizes the diffraction modulation transfer function (DMTF). Minimizing the image-spot size and position errors also minimizes and balances the Seidel and higher-order aberrations. 23 refs., 2 figs.

39728 (LA-UR—85-2182) Activated recombinative desorption: a potential component in mechanisms of spacecraft glow. Cross, J.B. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 10p. (CONF-8506145—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014092.

From 2. workshop on spacecraft glow; Huntsville, AL, USA (17 Jun 1985).

The concept of activated recombination of atomic species on surfaces is capable of explaining the production of vibrationally and translationally excited desorbed molecular species. Equilibrium statistical mechanics predicts that the molecular quantum state distributions of desorbing molecules is a function of only the surface temperature when the adsorption probability is unity and independent of initial collision conditions. In most cases though the adsorption probability is dependent upon initial conditions such as collision energy or internal quantum state distribution of impinging molecules. From detailed balance, such dynamical behavior is reflected in the internal quantum state distribution of the desorbing molecule. A number of surface-atom recombination systems demonstrate this "nonthermal" behavior: H_2-Cu,N_2-Fe,CO_2-Pt, etc. It is proposed that this concept, activated recombinative desorption, may offer a common thread in proposed mechanisms of spacecraft glow. Ground-based experiments are proposed which will complement

flight investigations probing the mechanism of the glow phenomenon. Using molecular beam techniques and equipment available at Los Alamos, which includes a high translational energy O-atom beam source, mass spectrometric detection of desorbed species, chemiluminescent/laser induced fluorescence detection of electronic and rovibrationally excited reaction products, and Auger detection of surface adsorbed reaction products, we propose a fundamental study of the gas-surface chemistry underlying the glow process. This would lead to the development of materials that could alter the spectral intensity and wave length distribution of the glow.

39729 **(LA-UR—85-2193) Los Alamos upgrade in metallographic capabilities.** Ledbetter, J.M.; Dowler, K.E.; Cook, J.H. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 5p. (CONF-851115—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014089.

From American Nuclear Society winter meeting; San Francisco, CA, USA (10 Nov 1985).

The Los Alamos Wing 9 Hot Cell Facility is in the process of upgrading their metallographic sample preparation and examination capability. The present capability to grind, polish and etch samples from reactor fuels and materials has been in operation for 18 years. Macro photography and alpha and beta-gamma autoradiography are an important part of this capability. Some of the fast breeder reactor experiments have contained sodium as a coolant. Therefore, the capability to distill sodium from some samples scheduled for microstructural examinations is a requirement. Since the reactor fuel samples are highly radioactive and contain plutonium, either as fabricated or as a result of breeding during reactor service, these samples must be handled in shielded hot cells containing alpha boxes to isolate the plutonium and hazardous fission products from personnel and the environment. The present equipment that was designed and built into those alpha boxes has functioned very well for the past 18 years. During that time the technicians have thought of ways to improve the equipment to do the work faster and safer. These ideas and ideas that have been developed during the design of new alpha boxes and new equipment for microstructural sample preparation have provided the concepts for the capability to perform the work faster and maintain the equipment in a safer manner.

39730 **(N—85-21571) Modeling of transient heat pipe operation.** Colwell, G.T.; Hartley, J.G. (Georgia Inst. of Tech., Atlanta (USA)). Feb 1985. 32p. (NASA-CR—175496). NTIS, PC A03/MF A01.

The overall goal is to gain a better understanding of the transient behavior of heat pipes operating under both normal and adverse conditions. Normal operation refers to cases where the capillary structure remains fully wetted. Adverse operation occurs when drying, re-wetting, choking, noncontinuum flow, freezing, thawing etc., occur within the heat pipe. The work was redirected towards developing the capability to predict operational behavior of liquid metal heat pipes used for cooling aerodynamic structures. Of particular interest is the startup of such heat pipes from an initially frozen state such as might occur during re-entry of a space vehicle into the Earth's atmosphere or during flight of hypersonic aircraft.

39731 **(NUREG/CR—4232) Response of ventilation dampers to large airflow pulses.** Gregory, W.S.; Smith, P.R. (Los Alamos National Lab., NM (USA)). Apr 1985. Contract W-7405-ENG-36. 68p. (LA—10413-MS). NTIS, PC A04/MF A01 - GPO. File Number TI85014221.

The results of an experiment program to evaluate the response of ventilation system dampers to simulated tornado transients are reported. Relevant data, such as damper response time, flow rate and pressure drop, and flow/pressure vs blade angle, were obtained, and the response of one tornado protective damper to simulated tornado transients was evaluated. Empirical relationships that will allow the data to be integrated into flow dynamics codes were developed. These flow dynamics codes can be used by safety analysts to predict the response of nuclear facility ventilation systems to tornado depressurization. 3 refs., 21 figs., 6 tabs.

39732 **(NUREG/CR—4260) TORAC User's Manual. A computer code for analyzing tornado-induced flow and material transport in nuclear facilities.** Andrae, R.W.; Tang, P.K.; Martin, R.A.; Gregory, W.S. (Los Alamos National Lab., NM (USA)). May 1985. Contract W-7405-ENG-36. 142p. (LA—10435-M). NTIS, PC A07/MF A01 - GPO. File Number TI85014236.

This manual describes the TORAC computer code, which can model tornado-induced flows, pressures, and material transport within structures. Future versions of this code will have improved analysis capabilities. In addition, it is part of a family of computer codes that is designed to provide improved methods of safety analysis for the nuclear industry. TORAC is directed toward the analysis of facility ventilation systems, including interconnected rooms and corridors. TORAC is an improved version of the TVENT computer code. In TORAC, blowers can be turned on and off and dampers can be controlled with an arbitrary time function. The material transport capability is very basic and includes convection, depletion, entrainment, and filtration of material. The input specifications for the code and a variety of sample problems are provided. 53 refs., 62 figs.

39733 **(PB—85-187805) Behavior of the dc impedance of an rf-biased resistive SQUID. Final report.** Van Vechten, D.; Soulen, R.J.; Peterson, R.L. (National Bureau of Standards, Washington, DC (USA)). 1980. 4p. Published in Proceedings of IC SQUID Int. Conference on Superconducting Quantum Devices (2nd), Berlin, Germany, May 6-9, 1980, p186-189.

Sponsored by Physikalisch-Technische Bundesanstalt, Berlin (Germany, F.R.), and European Physical Society, Geneva (Switzerland).

The authors measured the dc impedance of an rf-biased R-SQUID as a function of applied dc bias current, rf frequency and amplitude, and the critical current of the weak link. They conclude that the inclusion of an rf driving current, as required for parametric upconversion influences, in an as-yet incompletely modeled way, the dc impedance of an R-SQUID.

39734 **(SAND—85-1440C) Finned tube contact conductance: characterizing the integrity of the mechanical bond.** Ernest, T.L.; Sheffield, J.W.; Sauer, H.J. Jr. (Sandia National Labs., Albuquerque, NM (USA); Missouri Univ., Rolla (USA)). 1985. Contract AC04-76DP00789. 15p. (CONF-850606—10). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013747.

From American Society of Heating, Refrigerating and Air-Conditioning Engineers' semiannual meeting; Honolulu, HI, USA (23 Jun 1985).

Thermal contact conductance of expanded tube joints is dependent upon the interfacial pressure between the mating parts. A review of the literature indicates that very little work has been done towards relating the joint stresses to the dimensional parameters for mechanically expanded plate finned-tube heat exchangers, commonly called fin coils. This paper presents an experimental testing technique to investigate the fin-to-tube mechanical bond based upon the axial pull strength of the joint. Typical coils from two manufacturers were used in this investigation. They were fabricated from 3/8 in. copper tubes and plate aluminum fins. The coils tested had fin spacings of 6, 7, 8, 12, and 20 fins per inch, fin thicknesses of 0.008 and 0.0055 in. Tube thicknesses of 0.015 and 0.016 in. and diametrical interferences of 0.001, 0.006, and 0.010 in. The maximum force attained during a tube pullout was found to be descriptive of the bond. Plots of this force versus fin number and net interference are presented that illustrate the sensitivity of this force to the fin thickness, fin number, and net interference. These plots show that the fin thickness has the predominant effect on the pullout force and, in turn, the bond between the fin collar and the tube.

39735 **(SRD-R—309) Design criteria and principles for criticality detection and alarm systems.** Delafield, H.J.; Clifton, J.J. (UKAEA Safety and Reliability Directorate, Culcheth). Oct 1984. 59p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781308.

The report gives design principles and criteria for criticality detection and alarm systems based on earlier work and revised in the light of more recent experience. In particular, account is taken of the developments which have taken place in the field of radiation detection and in the understanding of the different types of criticality excursion. General guidance is given on the principles to apply in deciding upon the need for a criticality system. The characteristics of a criticality incident are described in terms of the minimum incident of concern, and the radiation field. Criteria for the threshold of detection of a criticality incident are then derived and the methods of detection considered. The selection and siting of criticality detectors is discussed, and design principles are given for alarm systems. Finally, testing and post-alarm procedures are outlined, followed by a summary of the principal recommendations. The supporting Appendices include a discussion of reliability and a summary of radiation detector characteristics.

39736 **(UCID—20459) Estimating the reliability of fiber optics cables.** George, L.L. (Lawrence Livermore National Lab., CA (USA)). 7 May 1985. Contract W-7405-ENG-48. 23p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014892.

This report estimates the reliability of fiber optics cables used in underground nuclear tests. Reliability is the probability of receiving signals transmitted from tests. This report uses the numbers of cable and fiber failures to estimate cable and fiber reliabilities. It uses cable and fiber reliability estimates to estimate the reliability of a signal transmission design, the probability of receiving at least one copy of each signal from a test. It shows that reliability estimates differ due to manufacturer, user, and depth of burial. And it shows one way to quantify the uncertainty in reliability estimates. This report should be used to help design reliable signal transmission systems. The data came from 43 tests done prior to FY 85 which used fiber optics cables. The users are Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Department of Defense. The data are numbers of fiber and cable failures, manufacturers and users, and depths of burial. Samples proportions estimate the fiber and cable reliabilities. Statistics test whether reliability estimates differ significantly between manufacturers and between users. Linear regression models failure rates as functions of depths of burial and tests whether failure rates depend on depths of burial. Probability theory quantifies the uncertainty in the reliability of one test with percentiles of the reliability estimate. Designers may use these results to compare alternatives for sending signals through fiber optics cables and to increase reliability with redundancy.

39737 **(ZfK—541) Fault diagnosis and performance monitoring for pumps by means of vibration measurement and pattern recognition.** Grabner, A.; Weiss, F.P. (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). Dec 1984. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701880.

In recent years the early detection of malfunctions with noise and vibration analysis techniques has become a more and more important method for increasing availability and safety of various components in technical plants. The possibility of pattern recognition assisted vibration monitoring and its practical realization are demonstrated by failure diagnosis and trend analysis of the condition of large centrifugal pumps in hydraulic circuits. Some problems as, e.g., the finding of dynamic failure models, signal analysis, feature extraction and statistical pattern recognition, which helps automatically to decide whether the pump works normally or not, are discussed in more detail. In the paper it is shown that for various types of machines the chance of success of condition based maintenance can be enhanced by such an automatic vibration monitoring.

39738 **Quantum measurement problem and quantum fluids.** Kraichnan, R.H. (303 Potrillo, Los Alamos, New Mexico 87544). *Physical Review Letters;* **54**: No. 25, 2723-2723(24 Jun 1985). Contract W-7405-ENG-36.

A Comment on the Letter by A. J. Leggett and A. Garg, Phys. Rev. Lett. 54, 857 (1985).

39739 **Advances in cryogenic engineering. Volume 29.** Fast, R.W. New York, NY; Plenum Press (1984). 1071p. (CONF-830841—).

From Cryogenic engineering conference; Colorado Springs, CO, USA (15 Aug 1983).

Applications of superconductivity are discussed, taking into account the thermal performance of the MFTF magnets, the design and testing of a large bore superconducting magnet test facility, the development of a 12-tesla multifilamentary Nb3Sn magnet, a superconducting magnet for solid NMR studies, advanced applications of superconductors, transition and recovery of a cryogenically stable superconductor, and finite-difference modeling of the cryostability of helium II cooled conductor packs. Other topics explored are related to resource availability, heat exchangers, heat transfer to He I, liquid nitrogen, heat transfer in He II, refrigeration for superconducting and cryopump systems, refrigeration of cryogenic systems, refrigeration and liquefaction, dilution and magnetic refrigeration, cryocoolers, refrigeration for space applications, cryogenic applications, cryogenic instrumentation and data acquisition, and properties of fluids. Attention is given to biomedical applications of cryogenics in China, long-term cryogen storage in space, and a passive orbital disconnect strut.

4203 Lasers

REFER ALSO TO CITATION(S) 40100

39740 **(AD—912787/9/XAB) Thermal-optic distortion-free solid-laser technology. Final report, 30 November 1970-30 September 1972.** Hagen, W.F. (American Optical Corp., Southbridge, MA. Research Div.). Jul 1973. 110p. (TR—617-F). NTIS, PC A06/MF A01.

This report summarizes the design considerations and experimental results obtained from four different disc lasers. These devices were successfully operated as amplifiers and oscillators at high average powers. The results were compared with the performance of solid rods of both circular and rectangular cross section. The thermal lensing, which limits the performance of solid rods, especially under Q-switched operation, was essentially eliminated with the disc approach. With the disc amplifier, transmission and gain values very close to those of solid rods have been measured. The single pass distortions were reduced by over one order of magnitude, which corresponds to an improvement in amplifier radiance of about two orders of magnitude for the disc laser in comparison to an equivalent solid rod. For Q-switched pulses, an average output power of 110 W was obtained with the disc amplifier operating at 5 pps. With the disc laser operating as normal mode oscillator, an average output power of 420 W was measured with an improvement in average radiance by a factor of 27 over that of an equivalent solid rod at its fracture point. The performance of disc lasers is limited by thermal-optic distortions in the coolant and by depolarization losses observed in Brewster disc lasers. The depolarization losses can be avoided with the normal incidence disc approach. To reduce the thermal-optic distortions in the coolant requires careful design of the flow channels and a coolant with a low thermal index coefficient.

39741 **(AD-A—152917/1/XAB) Low-voltage free-electron laser development. Final report, 1 February 1982-31 October 1984.** Harvey, R.J.; Dolezal, F.A. (Hughes Research Labs., Malibu, CA (USA)). Feb 1985. 56p. NTIS, PC A04/MF A01.

The two-beam, two-stage Free Electron Laser (FEL)1 offers the possibility of a compact, low-voltage FEL (LVFEL). This LVFEL development program addressed the issues of the first stage of such a LVFEL. During the course of this program, the first plane-polarized mm-wave FEL oscillator was demonstrated. The FEL operates at 31 Ghz with an output power of 60 kW. Radiation on the forward- and backward-wave portions of the dispersion curve was observed. The gain of the device was estimated, from the signal buildup time, to be approximately 5% for both forward- and backward-wave operation. The line-width of this device was measured in the forward-wave mode to be 11.7% in voltage space and <4.8% in frequency space. These line-widths correspond well to theoretically predicted values of 3.1 and 3.7%, respectively.

The polarization of the device was measured to be roughly perpendicular to the direction of the wiggler field.

39742 **(AD-A—152928/8/XAB) Construction techniques of a molecular hydrogen laser. Interim technical report.** Babis, J.S.; Huth, T.C.; Denton, M.B. (Arizona Univ., Tucson (USA). Dept. of Chemistry). 20 Mar 1985. 12p. (TR—38). NTIS, PC A02/MF A01.

Prepared in cooperation with Beckman Instruments, Irvine, CA.

Simple techniques are described for construction of a discharge channel and spark-gap trigger electrode for a travelling-wave excited molecular hydrogen laser.

39743 **(AD-A—153210/0/XAB) Injection laser structure design. Final report, 1 May 1980-31 August 1984.** Butler, J.K. (Southern Methodist Univ., Dallas, TX (USA)). 30 Jan 1985. 81p. NTIS, PC A05/MF A01.

Injection lasers have potential for replacing many of the high-power conventional gas lasers. The research performed in this project was aimed at the design of high-power semiconductor lasers for communications, printing, and other uses. Diode lasers were analyzed for obtaining high output power at single frequencies and for optical pattern stability. The following laser types: 1) gain guided, 2) index guided, and 3) W-Guided.

39744 **(AD-A—153366/0/XAB) Instabilities and chaotic behavior of active and passive laser systems. Final report, 1 December 1981-6 December 1984.** Narducci, L.M. (Drexel Univ., Philadelphia, PA (USA)). Mar 1985. 46p. NTIS, PC A03/MF A01.

The main thrust was to investigate the occurrence of unstable behaviors in active and passive quantum optical systems. Considerable theoretical progress was made with optical bistability to the point that no additional efforts appear to be needed on this front. Research is still very active, instead, to understand the origin of pulsations and chaos in lasers with an injected signal, laser systems with a nonuniform transverse intensity profile, and inhomogeneously broadened high-gain lasers.

39745 **(RAL—84-124) Vulcan pulse generating system.** Danson, C.N.; Edwards, C.B.; Wyatt, R.W.W. (Rutherford Appleton Lab., Chilton (UK)). Jan 1985. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701761.

During the past two years several changes have been made to the front end system on the VULCAN pulse generating system. These changes give greater flexibility and a wider choice of operating conditions. This note gives an updated description of the system capabilities, and gives users of the facility an idea of the various pulse combinations that are available.

39746 **(UCRL—92170) Spectrally-broad picosecond light source.** Rotter, M.D. (Lawrence Livermore National Lab., CA (USA)). 18 Jul 1985. Contract W-7405-ENG-48. 5p. (CONF-850887—10). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015177.

From SPIE international technical symposium on optical and electro-optical engineers; San Diego, CA, USA (18 Aug 1985).

We describe a fast (35 ps or less), spectrally broad (at least 600 nm) light source for use in characterizing and calibrating photonics equipment. The spectral output of the source is described, and examples of its use are given. 6 refs., 7 figs.

39747 **Molecular chemiluminescence from Mercury halides excited in an atmospheric-pressure active-nitrogen afterglow.** Rice, G.W.; D'Silva, A.P.; Fassel, V.A. (Ames Laboratory and Department of Chemistry, Iowa State University, Ames, Iowa 50011). *Applied Spectroscopy;* **39**: No. 3, 554-557(May 1985). Contract W-7405-ENG-82.

It is demonstrated that an atmospheric-pressure, active-nitrogen (APAN) afterglow can be used as an excitation source for $HgCl_2$, $HgBr_2$, and HgI_2 introduced into the afterglow. The emission spectra obtained upon the introductiion of $HgCl_2$, $HgBr_2$, and HgI_2 vapors into the APAN afterglow are presented. (AIP)

39748 **Far-wing (N+1)-photon transition formula for variable bandshape laser.** Wodkiewiez, K.; Yen, J.J. (Department of Physics and Astronomy, University of Rochester, Rochester, NY 14627). pp 397-400 of Coherence and Quantum Optics V. Mandel, L.; Wolf, E. New York, NY; Plenum Press (1984). (CONF-830616—).

From 5. Rochester conference on coherence and quantum optics; Rochester, NY, USA (13 Jun 1983).

Investigations of general multiphoton processes induced by anonLorentzian band shape laser lead to difficulties related to solutions of multiplicative stochastic equations valid for all time scales involved in the problem. In this paper, the authors consider the spectral region where the band shape influences are most pronounced, i.e., in the far wing. In this case, the general formula for atomic N-photon rates is given in terms of a well-known convolution integral of the atomic spectrum and of the laser's N-photon power spectrum. This general formula is applied to the example of so-called (N+1)-photon absorption, in which N-photons are absorbed in a transition to a near-resonant intermediate level, followed by one-photon coherent absorption or ionization to a broad final level.

39749 **Observation of intensity fluctuations and mode correlations in a broadband CW dye laser.** Westling, L.A.; Raymer, M.G.; Sceats, M.G.; Coker, D.F. (Univ. of Rochester, NY). *Optics Communications;* **47**: No. 3, 212-217(1 Sep 1983).

The authors studied the intensity fluctuations of a free running, broadband, standing-wave cw dye laser. The intensity autocorrelation function has been measured using a frequency-doubling autocorrelator with picosecond time resolution. The measurements at low laser powers reveal the development of stable mode correlations through spatial hole burning. These mode correlations are found to disappear abruptly as the laser power is increased above a critical point. A model for describing these mode correlations and the transition to uncorrelated behavior is presented. 16 references, 4 figures.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 38743, 38744, 39145, 39311

39750 **(ANL/FE—85-2) Heat pipe technology for coal-fired power systems.** Uherka, K.L.; Holtz, R.E.; McLennan, G.A.; Koehl, E.R. (Argonne National Lab., IL (USA)). Apr 1985. Contract W-31-109-ENG-38. 157p. NTIS, PC A08/MF A01; GPO Dep. File Number DE85015237.

This report summarizes the results of heat pipe R and D activities at Argonne National Laboratory (ANL) during the 1977 to 1984 time period. The heat pipe development efforts were associated with a variety of DOE supported projects involving coal-fired prime movers for stationary power generation. The role of heat pipes for these power systems is in their potential application as thermal transport systems for integrating fluidized bed combustors (FBC) with prime movers ranging from Stirling engines in total energy systems (~10 MWe) to closed-cycle gas turbines in central power plants (~1000 MWe). The results of initial investigations at ANL demonstrated that high-temperature sodium heat pipes provided the best heat exchanger technology for integrating Stirling engines with coal-fired FBC systems. A major accomplishment included the development and validation of a computer code (ANL/HTP) which calculates heat pipe operating limits and other significant characteristics necessary for power plant design. A number of developmental and prototype heat pipes were designed and fabricated through a subcontract effort with Thermacore, Inc., and delivered to ANL for performance testing. Preliminary test results from ANL's Heat Pipe Test Facility, using induction heating and a gas-water calorimeter to establish energy balances, are given in the report. Test data obtained to date are consistent with ANL/HTP code predictions. 47 refs., 53 figs., 22 tabs.

39751 (BNL—36665) High temperature and pressure particulate flow loop. Wegrzyn, J. (Brookhaven National Lab., Upton, NY (USA)). Apr 1985. Contract AC02-76CH00016. 12p. (CONF-850406—13). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015192.

From International symposium and workshop on particulate and multi-phase processes and the 16th annual meeting of the Fine Particle Society; Miami Beach, FL, USA (22 Apr 1985).

A 1700°F and 300 psi particulate laden flow loop for flows up to 3000 SCFM has been built at Brookhaven National Laboratory and installed at the Department of Energy's Morgantown Energy Technology Center. The purpose of this test facility is the investigation of multiphase particle/gas flow phenomena, high temperature erosion studies, and on-line instrument calibration. The salient features of this flow loop are in its closed loop design, which then permits a low volumetric particle feed rate, in its application of a on-line particle/gas separator and finally in its use of a pneumatic air flow amplifier (eductor). The loop is similar in category to an extrained bed reactor since the feed particles are continuously entrained in the flow and where only a portion of the gas stream is exhausted to maintain a constant pressure level. This presentation discusses the design strategy, the flow and temperature control, as well as the instrumentation that went into the construction of this particle/gas high temperature and pressure test facility.

39752 (DFVLR-FB—84-43) Mass and heat transfer in reflux condensers of absorption heat pumps. Mack, R. (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Hardthausen (Germany, F.R.). Inst. fuer Chemische Antriebe und Verfahrenstechnik). 1984. 42p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE85752200.

With 14 refs. and 19 figs. .

An equation is presented to compute horizontal reflux condensers. It makes mass and heat transfer computable depending from known numerical values of the process variables. The equation was reconsidered by experiments with two absorption heat pumps working with ammonia water solution. Parameter studies were made with a computer programme to show the different dependences and to guarantee an efficient construction. At last the programme was extended to make possible the computation of other than nominal conditions. Computation results were compared with test results and showed a good agreement.

39753 (IKE—5-220) Laminar film condensation in vertical closed two-phase thermosyphons. Spendel, T. (Stuttgart Univ. (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme). Feb 1985. 120p. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE85752357.

The present work deals with the calculation of laminar film condensation heat transfer in closed two-phase thermosyphons taking into account the influence of the existing vapor flow. In order to simplify the basic thermodynamic and fluiddynamic equations for liquid flow Nusselt's assumptions are used. The vapor flow is calculated based on the complete conservation equations for steady incompressible two-dimensional flow for which a finite difference method is applied in order to solve the existing system of equations. It is shown that the influence of the vapor flow on the heat transfer depends on the value of the Froude-number. In addition the influence of temperature dependent thermophysical properties as well as the condensation parameter on heat transfer is investigated.

39754 (INIS-BR—247) Film condensation on a porous vertical surface in a porous media. Ebinuma, C.D.; Liu, C.Y.; Ismail, K.A.R. (UNESP, Guaratingueta (Brazil). Faculdade de Engenharia). 1983. 9p. (In Portuguese). (CONF-8310381—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781442.

From 11. meeting on flow in porous media; Rio de Janeiro, RJ, Brazil (19 Oct 1983).

The problem of dry saturated steam film condensation by natural convection on a porous surface in a porous medium is presented. Through the classical Darcy law for flow in porous medium and the approximations considered in the Boundary layer theory, it is shown that the analytical solution exists only when the normal velocity to the porous wall is inversely proportional to the square root of the distance along the plate.

39755 (INIS-BR—260, pp 331-344) Comparison of the results from ABRE-3 computer code with other models and with experimental results. Motta, A.M.T.; Kinrys, S.; Roberty, N.C.; Oliveira, L.F.S. de; Carmo, E.G.D. do (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Posgraduacao de Engenharia). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The results obtained with a two-dimensional model with three regions of heat transfer for the rewetting velocity calculation are compared with the results calculated with other models and with experimental data obtained by other researches and a good agreement was observed.

39756 (INIS-BR—260, pp 345-366) Measurements of void fraction in a heated tube in the rewetting conditions. Freitas, R.L. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The methods of void fraction measurements by transmission and diffusion of cold, thermal and epithermal neutrons were studied with cylindrical aluminium pieces simulating the steam. A great set of void fraction found in a wet zone was examined and a particular attention was given to the sensitivity effects of the method, mainly for high void fraction. Several aspects of the measurement techniques were analyzed, such as the effect of the phase radial distribution, neutron energy, water tempeture, and effect of the void axial gradient. The technique of thermal neutron diffusion measurement was used to measure the axial profile of void fraction in a steady two-phase flow, where the pressure, mass velocity and heat flux are representative of the wet conditions. Experimental results are presented and compared with different void fraction models.

39757 (LBL—19084) Study of two-phase concurrent flow of steam and water in an unconsolidated porous medium. Verma, A.K.; Pruess, K.; Tsang, C.F.; Witherspoon, P.A. (Lawrence Berkeley Lab., CA (USA)). Apr 1985. Contract AC03-76SF00098. 11p. (CONF-850810—21). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014534.

From National heat transfer conference; Denver, CO, USA (4 Aug 1985).

A combined experimental and numerical study of two-phase steam/water flow in porous media was carried out. An experiment consisting of steady state, two-phase concurrent flow of steam and water was conducted to obtain a set of relative permeability and capillary pressure curves. The experimental relative permeability and the capillary pressure curves were included in a numerical code, MULKOM, and the experiment was simulated. A good agreement between the numerical results and the experimental data was found, thus confirming the results. Upon comparing these results with gas/oil and oil/water relative permeabilities obtained by other investigators, it was found that while the wetting phase relative permeabilities in all cases are about the same, the vapor phase relative permeability is larger than the non-wetting phase relative permeabilities in gas/oil or oil/water flows. It is suggested that the phenomenon of enhanced vapor phase relative permeability is caused by channeling and/or phase transformation effects.

39758 (NP—5770325) Effects of the inhomogeneous current and magnetic field on the flow characteristics of the mercury film of a chlorine alkali electrolysis cell. Schulte, L.F. (Karlsruhe Univ. (T.H.) (Germany, F.R.). Fakultaet fuer Maschinenbau). 23 Dec 1983. 135p. (In German). NTIS (US Sales Only), PC A07/MF A01. File Number DE85770325.

The author investigated the flow characteristics of a mercury film in inhomogeneous current and magnetic fields of a chlorine alkali electrolysis cell. The current and the pertinent electric field of an amalgam chlorine alkali electrolysis cell induce electromag-

netic forces in the mercury film which in turn influence the velocity profiles and thus also the mercury surface. The electromagnetic forces induce waves resulting from the periodicity of the cathode connections and the current density. Short circuits may occur between the anode and the mercury cathode. The waves can be reduced, e.g., via the busbar-to-cathode connections, the current load on a cell, and the different current loads on the anodes.

4205 Materials Testing

REFER ALSO TO CITATION(S) 39000, 39478, 39523, 40067

39759 **(AERE-MPD/NBS—261) Neutrons for materials science.** Windsor, C.G.; Allen, A.J.; Hutchings, M.T.; Sayers, C.M.; Sinclair, R.N.; Schofield, P.; Wright, C.J. (UKAEA Atomic Energy Research Establishment, Harwell. Materials Physics and Metallurgy Div.). Dec 1984. 21p. (IAEA-CN—46/045). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701744.

The discussion will be limited to applied materials research performed on a customer/contractor basis. The information obtained using neutrons must therefore compete both scientifically and financially with information obtained using other techniques, particularly electron microscopy, X-ray, NMR, infrared and Raman spectroscopy. It will be argued that the unique nature of the information gained from neutrons often outweighs the undoubted difficulties of access to neutron beams. Examples are given. Small angle scattering has emerged as the neutron technique of widest application in applied materials research. The penetration of neutron beams through containment vessels, as well as through the sample, allows the measurement of in situ time dependent experiments within a furnace, cryostat, pressure vessel or chemical reactor vessel. High resolution powder diffraction is another technique with wide applications. Structural studies are possible on increasing complex phases. The structure and volume fraction of minority phases can be measured at levels appreciably below that possible by X-ray diffraction. A rapidly growing field at present is the measurement of internal strains through the small shifts in lattice spacing. Inelastic scattering measurements exploit the unique property of neutrons to measure the orientations of vibrating molecules.

39760 **(BMFT-FB-T—84-271) Testing of oil field tubulars of large diameter under extreme borehole conditions.** Marx, C.; Sieme, U.; Krug, G. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1984. 112p. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE85752189.

Two test facilities, called RP 3 and RP 4, have been built for testing oil field tubular goods of diameter larger than 7 in. With RP 3, pipes up to 18-5/8" OD and 5 m (17 ft) length can be tested for collapse resistance. With the use of the RP 4 unit, pipe connections up to 10-3/4" OD can be tested for gas tightness under simulated borehole conditions. The largest pipe investigated during the test program was 13-3/8" for RP 3 and 10-3/4" for RP 4. A new method for calculating the collapse strength under superimposed tensile loads is described. It is based on the principle of the reduced yield strength. The test results confirm the proposed method. A "modified" API RP 37 method has been applied for proving the gas tightness of connections. Test results show that Teflon rings provide a reliable secondary seal only under certain conditions. Connections with metal-to-metal seal and shoulder should be controlled by position, not by the specified make-up torque, to ensure gas tightness. All known test methods for controlling gas tightness in the field fail, because sealing by the thread lubricant is only temporary but exceeds by far any acceptable testing time.

39761 **(DOE/ER/13163—7) Mechanical interactions of rough surfaces. Quarterly progress report, April 1, 1985-June 30, 1985.** McCool, J.I.; Hadden, G.B. (SKF Industries, Inc., King of Prussia, PA (USA)). Jul 1985. Contract AC02-84ER13163. 45p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015011.

SKF report No. AT85D031.

The project, Mechanical Interactions of Rough Surfaces addresses a number of unresolved issues which impact the design of mechanical systems in which surface microtopography per se or events which occur on the microgeometric scale play a critical role. The project is an experimental/analytical investigation to: (1) Explore the behavior of lubricated concentrated contacts involving microscopically rough surfaces under conditions of combined rolling, sliding and spinning with and without the presence of contaminating particles. (2) Develop processing principles and techniques for the analysis of digitized rough surface profiles to yield surface descriptors that are predictive of functional performance and which have acceptable systematic and random error. The work is being conducted within two distinct tasks: In Task I, a rig designed and built by SKF is used to provide optical interferograms of the lubricated contact of rough surfaces along with measurements of the traction transmitted under conditions of combined rolling, sliding and spinning. The objective of Task II is to develop guidelines and techniques for the processing of surface roughness data generated in analog form by a stylus profile instrument to provide interpretable predictions of surface performance in contact.

39762 **(EGG-M—17884) Economic evaluation of concurrent welding and nondestructive examination.** Watkins, A.D.; Johnson, J.A.; Smartt, H.B. (EG and G Idaho, Inc., Idaho Falls (USA)). 1985. Contract AC07-76ID01570. 20p. (CONF-8504102—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014623.

From 66. American Welding Society annual meeting; Las Vegas, NV, USA (28 Apr 1985).

This evaluation estimates the cost savings of implementing the concurrent welding and nondestructive examination technique, for a proposed welding operation, to be $73.26 per meter ($22.33 per lineal foot) of weld. A hypothetical weld operation was developed using standard data from nonrepetitive work measuring programs. Proposed changes to this weld operation to implement the concurrent welding and nondestructive examination were analyzed via a comparison between the proposed and hypothetical weld operation. Standard methods were used to calculate the cost savings between the sequential differences of the two weld operations.

39763 (JINR—D-13-84-53, pp 317-320) **Czechoslovak system for X-ray and neutron nondestructive testing.** Spunda, J.; Bizek, V.; Hrdlicka, Z.; Ohanka, B. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The X-ray and neutron non-destructive testing system for welds and casts testing is developed. The 30-400 kV X-ray tube isotope source or a reactor with 10^7 n/cm^2 X s thermal neutron flux is used as a radiation source. The object image gets to the television camera. Some system CAMAC modules are briefly described.

39764 **(NIIAR—39(604)) Experimental data-logging and processing equipment used in material researches based on electric resistance method.** Marusev, V.I.; Kashkirov, A.A.; Fedorov, Yu.D.; Ul'yanov, V.Yu.; Naumnikov, V.I.; Raetskij, V.M.; Polenok, V.M.; Temnoeva, T.A.; Pinchuk, A.M. (Nauchno-Issledovatel'skij Inst. Atomnykh Reaktorov, Dimitrovgrad (USSR)). 1983. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701908.

An automated equipment is developed to resister and process experimental data obtained by the method of electric resistance widely used in studies on the kinetics of radiation damages to materials and easily realized under conditions of protective chambers and reactor research channels. The equipment is based on the alpha-numeric display and operates with the BEhSM-6 computer. The functional diagram of the device and its main specifications are presented.

39765 **Maximum entropy reconstruction of a volume anomaly from pulse scatter data.** Bevensee, R.M. (Lawrence Livermore National Lab., CA). pp 889-897 of Review of progress in quantitative nondestructive evaluation. Vol. 3B. Thompson, D.O.; Chimenti, D.E. (eds.). New York, NY; Plenum Publishing Corporation (1984). Contract W-7405-ENG-48.

The Boltzmann (non-Burg) Maximum Entropy method described in Volume 2, Review of Progress in Quantitative NDE (1983), is applied to the problem of inferring the shapes of extremely underdetermined volume anomalies from scattered waves on the incident (plane) wave side of the volume probe. The relevance of the entropy concept for this problem is shown. The efficacy of two versions of the method (radiating source and ray path) is indicated by two-dimensional synthetic-data problems involving only scalar-wave displacement and no shear/compressional wave mixing. 2 references, 2 figures.

4206 Safety Engineering

39766 (CONF-8506148—3) Future directions in mobile teleoperation. Hamel, W.R. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 22p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014308.

From Workshop on requirements of mobile teleoperators for radiological emergency response and recovery; Dallas, TX, USA (23 Jun 1985).

Mobile teleoperator systems are the subject of an increasing amount of research and development. This work is motivated by general problems of remote operations in hazardous environments, some of which are very similar to the challenges of radiological emergency response and recovery. Current work appears to fall into two broad economic classes, one in the $100 K range and the other in the $1000 K range. Both are believed to be important for technology development and deployment. Recent developments confirm that we are at the technical doorstep of next-generation mobile systems which integrate dexterous manipulation, high mobility, and telerobotic operation.

39767 (RFP—3855) Options for operational risk assessments. Dover, S.A. (Rockwell International Corp., Golden, CO (USA)). 1985. Contract AC04-76DP03533. 12p. (CONF-850723—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014904.

From 7. international system safety conference; San Jose, CA, USA (25 Jul 1985).

Risk assessment is a set of analytical tools that can be used to clarify possible outcomes of decisions where two different courses of action are indicated or different values are in conflict. These conflicts often arise in the management of any production or support facility. This paper outlines the options for performing risk assessments of any scope and the parameters that determine their effectiveness. It highlights the relative costs of each option, useful information developed, and limitations of the information. The paper concludes with the types of decisions that are routinely made in an operating facility and could benefit from the information generated in a risk assessment.

4207 Vacuum Engineering

REFER ALSO TO CITATION(S) 39500

4208 Electr[illegible]ic Circuits And Devices

REFER ALSO TO CITATION(S) 39797, 39804, 40039

39768 (AD-P—004607/8/XAB) Superconducting-cavity-stabilized ruby maser oscillator. Dick, G.J.; Strayer, D.M. (California Inst. of Tech., Pasadena (USA)). 2 Apr 1984. 17p. NTIS, PC A02/MF A01.

This article is from Proceedings of the Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting (15th) Held at Washington, DC on 6-8 December 1983, AD-A149 163, p723-739.

Analysis of an application of the ruby maser to a superconducting-cavity-stabilized oscillator shows many attractive features. These derive from the mechanical stability inherent in an all-cryogenic design and from the properties of the ruby maser itself. A multiple-cavity design was developed to allow physical separation of the high-Q superconducting cavity and the ruby element with its required applied magnetic field. Mode selection is accomplished in this design by tuning the ruby by means of the applied field. It is concluded that such an oscillator would perform well, even with cavity Qs as low as 10^9 allowing the use of a superconductor-on-sapphire resonator with its greater rigidity and lower thermal expansion. A first test of the Superconducting Cavity Stabilized Maser Oscillator (SCSMO) confirms the efficacy of the multiple-cavity design and the applicability of the ruby maser. Frequency variation less than $4x10^{-11}$ was measured in the stabilized mode and is attributed to the reference oscillator and to instabilities in the pump source. Variation of 10^{-10} was observed in the low-Q unstabilized mode, again attributable to pump fluctuations. Even so, direct scaling to a Q of 10^9 predicts a stability better than 10^{-15}. Together with results showing the lowest losses to date in sapphire at microwave frequencies, and preliminary experiments on superconductor-on-sapphire resonators, frequency stability, levels as low as 10 to the minus 17th power are indicated.

39769 (BDX—613-3173) Printed wiring board process improvement. Final report. Evans, M.E.; Gentry, F.L. (Allied Corp., Kansas City, MO (USA). Bendix Kansas City Div.). Jul 1985. Contract AC04-76DP00613. 30p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015422.

This project investigated ways of improving printed wiring board (PWB) fabrication at BKCD. The primary objective of the machining portion was to determine the best manufacturing techniques for rigid double-sided and multilayer printed wiring products, and to identify the process changes required to implement those techniques. Another objective was to improve solder thickness and shelf life by using the hot air leveling process. All process variables were identified and a suitable manufacturing process was established. Copper plating of PWBs presently uses a solution of copper pyrophosphate that has several disadvantages. The properties of the copper deposit from an acid copper sulfate process and relative ease of chemical control offer advantages over the pyrophosphate process and are being evaluated for use.

39770 (GAO/NSIAD—85-37) GAO assessment of DOD's Very High Speed Integrated Circuits (VHSIC) technology program. (General Accounting Office, Washington, DC (USA). National Security and International Affairs Div.). 8 May 1985. 33p. US General Accounting Office, Box 6015, Gaithersburg, MD 20877. File Number TI85901766.

Report to The Secretary of Defense.

GAO reviewed DOD's Very High Speed Integrated Circuits (VHSIC) program - an effort to develop and demonstrate advanced data and signal processing technology for defense systems. Although progress has been made, the development, demonstration, and independent verification of first generation VHSIC technology is behind schedule. Nevertheless, DOD believes that VHSIC technology must be used in defense systems and in 1982 expanded the program to promote near-term system applications. In light of the delays and other problems, GAO is concerned with DOD's decision to further expand subsidies to stimulate earlier application of VHSIC technology. To achieve the goals of the program, GAO believes that DOD should emphasize progress goals for already approved contractor subsidies and the demonstration and independent testing of first generation VHSIC technology. This report discusses the expansion of the program, as well as the status of its original objectives, and recommends alternative ways for DOD to encourage system developers to promptly consider using VHSIC technology.

39771 (INPE—3081) 2-D impurity states associated with inversion layers. Cunha Lima, I.C. da; Guimaraes, P.S.; Silva, A.F. da; Senna, J.R.S. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). Apr 1984. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701715.

The density of states for electrons at the inversion layer of a MOS structure due to Na^+ impurities located in the oxide is obtained. The impurity potential is assumed unscreened. Disorder is considered to obtain the configurational averaged Green's function starting from a tight binding Hamiltonian.

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39772 **(JINR—10-84-670) Hardware for the operator-computer dialogue in the AEhLT-2/160 system on-line with the SM-4 computer.** Baranchuk, M.K.; Lapchik, Eh.D.; Rubtsov, V.F.; Smirnov, V.N.; Trifonov, A.V.; Shkundenkov, V.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1984. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781309.

A set of control units providing the operator's dialogue in the AEhLT-20160 measuring system on-line with the SM-4 computer is described. It consists of the control units for the display-monitor, an interface of functional keyboard and tableau register. Display-monitor control unit defines the display performance needed for data visual representation in scanning process. The interface of functional keyboard provides connection of operator's keyboard with the SM-4 computer and measuring system control. The tableau register is intended for the transmission of operating information from the SM-4 computer to an illuminated indicator panel. The units are performed in the CAMAC standard. 1 reference, 3 figures.

39773 (JINR—D-13-84-53, pp 19-25) **FASTBUS and typical applications.** Schoeps, W. (Schweizerisches Inst. fuer Nuklearforschung, Villigen). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The topology of the FASTBUS system, connection with the CAMAC system, used computers are briefly considered. Research institutes and laboratories where the FASTBUS system is implanted are enumerated. The greater speed of the system response as compared with others is pointed out.

39774 (JINR—D-13-84-53, pp 78-83) **Logic units for complex experimental facilities with inter-unit connections.** Borejko, V.F.; Baluev, Yu.M.; Grebenyuk, V.M.; Zinov, V.G.; Rudenko, A.I.; Selikov, A.V. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The description and technical characteristics of logic units realized in the CAMAC standard are given. For units connected with the trunck the logical functions control unit is unified. The signal shaper circuits, delay unit, coincidence unit, level matching unit, coincided signals detecting unit, pulse bursts generator for detector signal imitation are considered.

39775 (JINR—D-13-84-53, pp 84-87) **LO-1 and LO-2 - universal units for logical processing discrete nanosecond signals.** Berlev, A.I.; Vinogradov, V.I.; Isakov, V.V.; Karavichev, O.V. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

To reduce the overall dimensions of data acquisition and processing systems in nuclear physical experiments two types of logic processing units on arbitrary combination algorithms specified by the program are created. The LO-1 modulus performs by stages logic functions or from four 8-put coincidence circuits. The modulus processes amplitude formed signals of not less than 3 ns duration. The LO-2 modulus performes random logic coincidence functions over eight inputs Block-diagrams and main technical characteristics of modules performed in the CAMAC standard are presented.

39776 (JINR—D-13-84-53, pp 121-125) **Precision signal oscillator for Moessbauer spectroscopy.** Dimitrov, L.P.; Vankov, I.D.; Ormandzhiev, S.I.; Spasov, A.D. (Bylgarska Akademiya na Naukite, Sofia. Inst. za Yadrena Izsledvaniya i Yadrena Energetika). 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The oscillator for controlling piezoelectric vibrator in Moessbauer spectroscopic investigations with radioisotope ^{67}Zn is described. The oscillated periodic signal may have either a sinusoidal or parabolic form with controlled 10-1000 V amplitude. The oscillations frequency may be specified in the 60-1000 Hz range. In addition to analogous signal the oscillator creates necessary control pulses for multichannel counter, that records obtained data with a number of channels 128, 256, 512 or 1024. The oscillator is designed as a CAMAC unit without bus coupling. The stabilization and regulation of the signal amplitude is ensured in the +-0.1% limits. The signal frequency variation is less than +-0.001%, the nonlinear distortion factor is below 0.1%.

39777 (JINR—D-13-84-53, pp 362-366) **Microcomputer on-line control system for a big helium liquefier.** Agapov, N.N.; Bazyleva, N.P.; Belushkin, V.A.; Kolpakov, I.F.; Krylov, V.V.; Parfenov, A.N.; Skron'ski, Ya.; Slepnev, V.M.; Tlachala, V.; Turzo, I. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

For helium high capacity liquefier a microcomputer on-line control system in the CAMAC standard has been developed. The total number of measured values is 150. The data are collected from transducers of temperature, pressure, air driven turbo-engine rotation rate, liquid nitrogen and helium levels in proper capacitances as well as condition transducers of separate units of the facility. The number of controlled and actuating units is 20. The microprocessor controller MISKA controls the data acquisition and processing, control signals generation and data output onto the console. Operational experience has shown that the system operates satisfactorily and permits in the start and shut-down facility mode to save one highly qualified working unit while in that of liquefying is able to control the whole complex independently.

39778 (JINR—D-13-84-53, pp 367-371) **Microcomputer relay regulator in the CAMAC standard.** Nikolaev, V.P. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The digital relay regulator is developed on the base of the KM001 microcomputer and KK06 controller for automatic control objects with transfer functions describing a broad class of systems using actuating motors (stabilitation, follow-up systems). The CAMAC relay-unit realizes the regulation law and provides the possibility to control analogous values by 8 channels.

39779 **(JINR—D-13-84-53) 11. International symposium on nuclear electronics.** (Joint Inst. for Nuclear Research, Dubna (USSR)). 1984. 475p. (CONF-8309239—). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324.

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

Separate entries were prepared for the data base for the papers included. (WHK)

39780 **(LA-UR—85-1993) Tests of an explosi driven coaxial generator.** Caird, R.S.; Erickson, D.J.; Fowler, C.M.; Benjamin, R.F.; Williams, A.H.; Goforth, J.H.; Freeman, B.L.; Veeser, L.R.; Felber, F.S. (Los Alamos National Lab., NM (USA); JAYCOR, San Diego, CA (USA)). 1985. Contract W-7405-ENG-36. 4p. (CONF-850616—54). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014130.

From 5. IEEE pulsed power conference; Washington, DC, USA (10 Jun 1985).

The results of four tests on an explosive-driven sweeping-wave coaxial generator are reported. The first shot of the series used a capacitor bank to supply the initial current. The remaining three shots used an explosive-driven sweeping-wave helical generator to boost the initial current. On the final shot, a peak current of 50 MA was reached in a 12 nH load, corresponding to a peak energy of 15 MJ. The peak power was 1.5 TW and the final current-doubling time was 12.5 μs. In addition to conventional Rogowsky loops, Faraday rotation sensors were employed to measure

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the current. Arrays of microballoon optical-fiber pins were used to measure the shape of the armature under the action of the magnetic forces in the generator. The coaxial generator should be capable of achieving still higher output energies if higher input energies are provided.

39781 **(LA-UR—85-2021) Foil fuses as opening switches for slow discharge circuits.** Parker, J.V.; Parsons, W.M. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 5p. (CONF-850616—64). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014124.

From 5. IEEE pulsed power conference; Washington, DC, USA (10 Jun 1985).

Metal foil fuses embedded in various materials are widely used as opening switches in fast discharge circuits (~ 1 μs). Several technologies of current interest require opening switches in circuits which operate on a much longer time scale (~ 100 μs). We have investigated the behavior of aluminum and copper foil fuses for conduction times of 100 to 200 μs. Reliable current interruption is obtained at the end of melting rather than at the end of vaporization. The ratio of initial to final resistance is >100. In general, the performance of slow fuses can be predicted by simple scaling from fast fuse behavior. For applications where the switching function depends critically on the resistivity versus input energy characteristic, the results presented can be used in the selection of proper fuse size and geometry.

39782 **(LA-UR—85-2022) Railgun power supply system utilizing traction motors and vacuum interrupters.** Parsons, W.M.; Parker, J.V.; Thullen, P. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 4p. (CONF-850616—60). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014123.

From 5. IEEE pulsed power conference; Washington, DC, USA (10 Jun 1985).

A railgun power supply has been designed that utilizes traction motors, vacuum interrupters and pulse transformers. An assembly of 28 traction motors, which store approximately 75 MJ, energize the primary windings of three pulse transformers at a peak current of 50 kA. At peak current an array of vacuum interrupters disconnects the transformer primary windings and forces the current to flow in the secondary windings. The secondary windings are connected directly to the railgun and require no opening switches. By staging the vacuum interrupter openings, a 1 MA to 1.3 MA ramped current waveform can be delivered to the railgun.

39783 **(SAND—85-1487C) Alarm display and assessment technology.** Davis, R.F. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 6p. (CONF-850885—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85013788.

From 1. annual AFCEA symposium and exposition on physical and electronic security; Philadelphia, PA, USA (19 Aug 1985).

This report reviews the evolution of security alarm systems and discusses a variety of hardware components and software techniques that have been developed and used in alarm display and assessment applications from the human factors viewpoint. Additional system considerations that arise in the application of the new technologies to security applications are then discussed and the characteristics of several state-of-the-art systems are presented.

39784 **Theory of response of radiation sensing field effect transistors.** Hughes, R.C. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Journal of Applied Physics;* **58:** No. 3, 1375-1379(1 Aug 1985). Contract AC04-76DP00789.

Radiation sensing field effect transistors display a variety of nonlinear and saturating responses to ionizing radiation. A model involving the numerical solutions to the photoconductivity equations is presented which describes the response under a wide range of radiation doses and applied fields. The large, unexpected, response for zero bias demonstrates the importance of diffusion of the photocarriers. The simulations are consistent with the known transport parameters for SiO_2, with the main unknowns being the concentration of electron and hole traps. A variety of data at different applied voltages and doses can be fit with the same transport parameters.

4210 Combustion Systems

REFER ALSO TO CITATION(S) 38808

39785 **(PB—85-187961/XAB) Solids mixing in a three phase fluidized bed containing spherically shaped-porous solid particles. Open File report.** Snell, G.J.; Zopff, D. (Kentucky Univ., Lexington (USA). Inst. for Mining and Minerals Research). May 1984. 53p. (IMMR—84-098). NTIS, PC A04/MF A01.

Sponsored by Kentucky Energy Cabinet, Lexington.

Solids mixing in a 3-phase fluidized bed containing 1.8-mm nominal-diameter porous spherically shaped solids was studied using a batch-type tracer technique. High-speed photography was used to determine concentration-time traces of color-coded solid tracer in a region near the wall of a 2-in.-i.d. fluidization tube, located at a vertical elevation about 7 in. above the distributor. An add mixture of water and gaseous nitrogen at room temperature and essentially ambient pressure was used to fluidize a spherically shaped, nickel molybdate on alumina solid phase throughout this study. Superficial liquid velocity was varied from 0.60 to 0.155 ft./sec. and superficial gas velocity was varied from 0.00 to 0.04 ft./sec. An empirical steady-state mixing time was defined in order to characterize top-to-bottom of bed solids mixing. This mixing index was in turn correlated with superficial liquid velocity, superficial gas velocity, and an axial characteristic dimension. In all cases investigated a top to bottom steady-state tracer solids mixing time $<$ or $=$ 150 seconds was observed, and in the majority of runs made the steady-state solids mixing time observed was less than 60 seconds. In short, solids mixing was rather rapid.

4220 Underground Engineering

REFER ALSO TO CITATION(S) 39718

4240 Pollution Control Equipment

39786 **(BMFT-FB-T—84-253) Development of a stationary carbon monoxide detector.** Baack, D. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.); Ruhrkohle A.G., Essen (Germany, F.R.)). Dec 1984. 85p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE85752188.

To improve protection of persons and valuable material in underground mines from open and hidden mine fires was to be developed a carbone monoxide detector of the "intrinsical safety" protection type. For this purpose an existing detector for air pollutants had to be modified. Apart from the development of a potentiostate functioning in the μA range it was particularly time-consuming to conceive the relevant measuring chamber since comprehensive test series became necessary.

4250 Power Cycles

REFER ALSO TO CITATION(S) 39017

43 PARTICLE ACCELERATORS

4301 Design, Development, And Operation

REFER ALSO TO CITATION(S) 39806, 39810, 39879, 40573, 40577, 40580

39787 **(ANL/HEP-CP—85-43) Review of heavy ion collider proposals.** Ruggiero, A.G. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 6p. (CONF-850504—211). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014985.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

In this paper we review proposals for heavy-ion colliders generated during the last few years for several national laboratories.

The proposals span over a large range of energy and luminosity to accommodate the experimental needs of both the nuclear and the high-energy physicists. We report also briefly efforts in the same field happening in Europe.

39788 **(BNL—36626) Design for a high field combined function superferric magnet.** Gupta, R.C.; Morgan, G.H. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 2p. (CONF-850504—215). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014827.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

A combined function superferric magnet option has been investigated for the Relativistic Heavy Ion Collider (RHIC). The option requires the maximum value of the field in the magnet to be much higher than that achieved in any existing combined function accelerator magnet. A model is presented here in which a good field quality can be maintained up to 2T. It is done by carefully designing the yoke structure and positioning the coils in such a way that the iron poles tend to saturate evenly across the gap. A cold iron model might be necessary for this magnet. 4 refs., 2 figs., 1 tab.

39789 (INIS-mf—9311, pp 403-466) **Accelerator perspectives.** Domingo, J. (Schweizerisches Inst. fuer Nuklearforschung, Villigen). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

Summarized contributions to discussion.

I present the main machine characteristics together with my arbitrary choice of one or two interesting fields of research to be carried out with the machine.

39790 (INIS-mf—9311, pp 467-477) **K factory project.** Schott, W.; Wilhelm, W. (Technische Univ. Muenchen, Garching (Germany, F.R.). Fakultaet fuer Physik). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

For producing a high intensity of secondary particles as K, anti p, μ, νsub(μ) and n a series of accelerators consisting of a SIN injector II-type cyclotron, the superconducting sector cyclotron KISS, an accumulator, a rapid cycling synchrotron and a stretcher is proposed. It could deliver an 0.5 mA current (CW) of protons as primary particles at 30 GeV and an average current of 4.5 mA at 2.5 GeV. 11.1% percent of the protons at 2.5 GeV can be punched into pulses of 18 A peak current and 500 ns length at 50 Hz repetition frequency.

39791 **(INIS-mf—9426) Breeder accelerators: overview of some problems.** Lapostolle, P. (International Atomic Energy Agency, Vienna (Austria)). 1983. 4p. (CONF-8306262—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781443.

From Belgian Nuclear Society annual meeting on advanced uses of accelerators on the nuclear fuel cycle; Brussels, Belgium (13 Jun 1983).

Several proposals of spallator linacs have been made in the world and projects are being developed in several countries. The present report outlines the essential difficulties which are faced in these projects and, referring to physical limitations, lists some of the research and development problems which are or must be worked out.

39792 **(INIS-SU—289) Proceedings of the 8. All-union conference on the charged particle accelerators. Volume 1.** (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow; Joint Inst. for Nuclear Research, Dubna (USSR)). 1983. 383p. (In Russian). (CONF-8210133—Vol.1). NTIS (US Sales Only), PC A17/MF A01. File Number DE85781267.

From 8. All-Union conference on the charged particle accelerators; Protvino, USSR (19 Oct 1982).

Separate abstracts were prepared for each paper. (MOW)

39793 **(INP—1161/D) Anticipated radiological hazard in the AIC-144 cyclotron.** Niewiadomski, T. (ed.). (Institute of Nuclear Physics, Krakow (Poland)). 1981. 72p. (In Polish). NTIS (US Sales Only), PC A04/MF A01. File Number DE85701883.

Published in 1982.

A new AIC-144 cyclotron is being built within the radiation shields of the old U-120 accelerator. In order to evaluate the radiological hazard, the radiation protection problems were discussed and dose equivalent rates outside shields computed for the highest beam energy and intensity. The presented calculations and discussion show that there are no serious impediments to the location of the AIC-144 accelerator on the old site. It was found that the dose equivalent rates will exceed the permissible levels only in certain points in the new experimental hall, therefore it was recommended to thicken the shield in these points to 1.25 m. Since not all problems of radiological hazard could be theoretically solved at the present construction stage it was decided to conduct a through dosimetric research at the time when first particle beams shall be operated.

39794 **(JINR—9-84-523) Three-dimensional simulation of magnetic system elements of JINR superconducting synchrotron.** Borisovskaya, Z.V.; Alfeev, V.S.; Vorozhtsov, S.B.; Donyagin, A.M.; Lobanov, V.I.; Shelaev, I.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701885.

Results of numerical simulation of magnetic system elements (dipole magnets, quadrupole lenses) and of the analysis of nonlinear effects for different values of current in a coil are presented for the JINR superconducting synchrotron. Effective length distributions of the dipoles and quadrupoles versus current are obtained. Three-dimensional magnetostatic fields are calculated using the MAGSYS program system. The calculations are in good agreement ($2\text{-}3\times10^{-3}$) with the results on measuring magnetic fields and nonlinearities at liquid helium and room temperature.

39795 **(JINR—9-84-581) Dubna synchrophasotron. Performance and improvement (quarter 1, 1984).** Zabolotin, V.P.; Zinov'ev, L.P.; Isaev, A.S. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701886.

Information is presented about the performance of the synchrophasotron, its parameters at accelerating the helium, magnesium, oxygen nuclei and about the scientific research program. Improvements of feedback circuit permitted to obtain stable duration of the beam extraction out of the accelerator. This regime proves to be especially necessary for a possible variation of intensity of high charge nuclear beam in the accelerator ring. Geodetic measurements have been performed for control of vertical displacements of the synchrophasotron electromagnet.

39796 **(JINR—10-84-529) Single computer variant of software for accurate measurement of JINR phasotron subsystem parameters.** Anosov, V.N.; Denisov, Yu.N.; Leshchenko, G.P.; Saenko, V.A.; Shishlyannikova, Z.N.; Potempa, M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781320.

Single computer variant of software for an accurate measurements of parameters of the JINR phasotron (MESEX module) is intended for data acquisition from analogue signal detectors of any subsystem of the accelerator: RF system, ion source, magnet, extraction system and for displaying the measured data and communication with an operator. MESEX module basic principles permit to change easily the list of parameters and to add some new functional possibilities. The described software was used in the on-line control system for studying the ion sources and for the vacuum, ion source and magnet subsystems of the JINR phasotron. 9 references, 7 figures.

39797 (JINR—D-7-83-644, pp 568-579) **Nuclear track research at GSI Darmstadt.** Spohr, R. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Some nuclear track research activities performed at the national heavy ion accelerator facility GSI Darmstadt in the forefield of a future commercial application are described. For this purpose very heavy ions up to uranium are accelerated up to specific energies of about twenty million electron-volt per nucleon, corresponding to ion ranges is solids up to several tenths of a millimeter. Samples up to fifty millimeter diameter are homogeneously irradiated with areal doses ranging from one single ion per sample up to about 10^{12} ions per square centimeter. The following activities are described: small angle scattering of neutrons and X-rays for observing the diameter and length of latent tracks; manufacture of single-pore membranes for measuring the deformability of individual red blood cells; fining of magneto-optic materials for application in fast switchable displays and printers; heavy ion lithography for observing microscopic density variations (e.g. in biological objects) and for application as a microstructuring tool in microelectronics; prospects of the nuclear track etch technique for generating well-defined surface textures.

39798 (KIYI—83-15, pp 9-12) **U-240 isochronous cyclotron base equipment modernization.** Goloborod'ko, V.A.; Kamyshnikov, Yu.I.; Malofeev, A.I.; Ol'khovikov, A.B.; Pashin, V.A.; Pravednikov, G.N.; Sakhno, V.I. 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780968.

In Modernization of the U-240 isochronous cyclotron in 1982.

Complex operations directed at the improvement of the physical parameters of the U-240 cyclotron and at the enhancement of the equipment reliability in the process of operation, at the reduction of emergency and other downtimes were carried out during 1980-1982. A multichannel electronic system of control and protection of transistor and other elements from thermal overloads in power circuits of the cyclotron supply had been introduced. Updating of the V4-generator equipment permitted to organize a remote and more accurate tuning of the resonance system frequency without entering the cyclotron room. Due to the work on modernization the time of cyclotron operation with the beam increased from 3400 hrs in 1980 to 3740 hrs in 1982.

39799 (LBL—19579) **Design and performance of 40 mm, 6.5 T, collared, cold-iron model magnets.** Peters, C.; Gilbert, W.; Hassenzahl, W.; Mirk, K.; Rechen, J.; Scanlan, R.; Taylor, C. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—224). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015277.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Model magnets have been built and tested at the Lawrence Berkeley Laboratory to verify a candidate design for the main bending magnets of the SSC. Construction of this series of dipole models was begun in October 1984 and will be completed in October 1985. To date, three models with collars, C1, C2, and C3, have been completed. Models C1 and C2 have been tested.

39800 (LBL—19593) **Overview and status of the Transverse-Field Focusing (TFF) accelerator.** Anderson, O.A.; Chan, C.F.; Cooper, W.S.; Kwan, J.W.; Matuk, C.A.; Owren, H.M.; Paterson, J.A.; Purgalis, P.; Soroka, L. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—225). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015278.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

The Transverse Field Focusing (TFF) system described here is a prototype for a negative-ion based neutral beam line with possible applications in the US magnetic fusion energy program. The prototype system consists of four main modules: (1) H^- source, (2) 80 keV pre-accelerator, (3) TFF matching/pumping (M/P) section, and (4) 180 keV TFF accelerator. The first three modules have been installed on the beam line, with the fourth to follow soon. The crucial module, invoking the most difficult (and interesting) physics and engineering issues, is the M/P section. It performs: (a) gas removal from the beam by differential pumping, (b) electron removal, (c) beam thickness reduction to match the TFF accelerator parameters, and (d) beam-edge confinement. The four beamline modules are discussed in this survey, with emphasis on design features of the M/P section. 17 refs., 4 figs.

39801 (NIIEFA-P-B—0611) **Nonlinear effects in large cyclic accelerators.** Belov, V.P.; Makarov, A.A. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1983. 31p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701887.

A new approach to investigating nonlinear effects in large cyclic accelerators is suggested that permits to take into account the contribution from higher order nonlinearities, random and systematic deviations of the magnetic field from the ideal one. The approach is based on reducing the series over the degrees of betatron oscillation amplitudes and magnetic field derivatives, obtained from the truncated Bogolyubov-Krylov equations, to the integrals over the formal variables of the complete magnetic field as taken in the place of particle location.

39802 (SLAC-PUB—3716) **Status of the SLC damping rings.** Hutton, A.M.; Davies-White, W.A.; Delahaye, J.P.; Fieguth, T.H.; Hofmann, A.; Jager, J.; Kloeppel, P.K.; Lee, M.J.; Linebarger, W.A.; Rivkin, L. (Stanford Linear Accelerator Center, CA (USA)). Jun 1985. Contract AC03-76SF00515. 4p. NTIS, PC A02; 3; GPO Dep. File Number DE85015261.

Electron beams of full design energy 1.21 GeV and nearly full design intensity 4×10^{10} particles/pulse (design 5×10^{10}) have been extracted from the Stanford Linac and successfully stored in the electron damping ring. Beams of less intensity have been extracted from the ring and reinjected into the Linac. The present intensity limits are not thought to be fundamental. The operating experience with the electron ring and the status of the construction of the positron ring will be discussed. 11 refs., 1 fig., 2 tabs.

39803 (LA-tr—85-29) **Sealed ion accelerator tubes (survey).** Voitsik, L.R. (Los Alamos National Lab., NM (USA); Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Yadernoj Geofiziki i Geokhimii, Moscow (USSR)). 1985. Contract W-7405-ENG-36. Translated from Impul'snyy netronnyy karotazh; ONTI VNIIAGG, Moscow, 1968, pp 189-206. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014880.

The first publications on developing commercial models of small-scale sealed accelerator tubes in which neutrons are generated appeared in the foreign press in 1954 to 1957; they were very brief and were advertising-oriented. The tubes were designed for neutron logging of oil wells instead of ampule neutron sources (Po + Be, Ra + Be). Later, instruments of this type began to be called neutron tubes from the resulting neutron radiation that they gave off. In Soviet Union a neutron tube was developed in 1958 in connection with the development of the pulsed neutron-neutron method of studying the geological profile of oil wells. At that time the tube developed was intended, in the view of its inventors, to replace standard isotope sources with constant neutron yield. A fairly detailed survey of neutron tubes was made in the studies. 8 refs., 8 figs.

4302 Beam Dynamics, Field Calculations, And Ion Optics

REFER ALSO TO CITATION(S) 39799, 39834, 39884, 39920

39804 (ANL/HEP-CP—85-42) Low dispersion notch filter for multi-GHz frequencies using fiber optics delays. Simpson, J.D.; Konecny, R. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 3p. (CONF-850504—232). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014983.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Although their designs appear simple and straightforward, notch filters for application in stochastic cooling systems are frequently difficult to construct with acceptable characteristics. Problems arise because the components are less than perfect, coaxial cables have loss plus dispersion and other necessary hardware has limitations. Usually it is the delay line, typically a high quality coaxial line, which is the source of most problems. We report in this paper on the development of a notch filter which uses a laser diode/fiber optic delay line instead of a coaxial cable. Measurements of its properties indicate it to be a possible alternative to other designs. Bandwidth, dispersion, notch depth, dynamic range and intermodulation are each within the bounds of typical cooling system requirements.

39805 (BNL—36181) Possibilities of polarized protons in Sp anti p S and other high energy hadron colliders. Courant, E.D. (Brookhaven National Lab., Upton, NY (USA); State Univ. of New York, Stony Brook (USA)). 1984. Contract AC02-76CH00016. 3p. (CONF-8409162—15). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012517.

From 6. international symposium on high energy spin physics; Marseille, France (12 Sep 1984).

The requirements for collisions with polarized protons in hadron colliders above 200 GeV are listed and briefly discussed. Particular attention is given to the use of the "Siberan snake" to eliminate depolarizing resonances, which occur when the spin precession frequency equals a frequency contained in the spectrum of the field seen by the beam. The Siberian snake is a device which makes the spin precession frequency essentially constant by using spin rotators, which precess the spin by 180° about either the longitudinal or transverse horizontal axis. It is concluded that operation with polarized protons should be possible at all the high energy hadron colliders. (LEW)

39806 (DOE/ER/40043—T1) Collective focusing ion accelerator. Final technical report, July 1, 1981-June 30, 1984. Rostoker, N.; Fisher, A. (California Univ., Irvine (USA). Dept. of Physics). 1984. Contract AT03-81ER40043. 44p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85014206.

In the Collective Focusing Ion Accelerator, electrons are confined by an external magnetic field. The electrostatic field of the confined electrons form a Gabor lens which can guide and focus the ions. In a toroidal geometry, ions can be accelerated inductively as in a betatron, focused and held in their circular orbit by a series of Gabor lenses along the torus. The CFIA experiment consists of a glass torus 110 cm major diameter and 12 cm minor diameter. Sixteen magnetic mirror cells are distributed around the torus. Electrons are produced by 16 thermionic injectors (1 injector per cell). The electrons are trapped by a rising magnetic field and form the Gabor lenses. The inductive field was supplied in the CFIA by an iron core with $\sim 300\ cm^2$ cross section which could accelerate protons to more than 1 MeV. In order to accelerate ions they must be held by the lenses. The electron cloud was investigated in great detail. Early work had shown that the electron cloud oscillates in the radial direction in the mirror cells. These oscillations are very damaging to the focusing quality of the lens. The off-centering and the wobbling of the electrons was studied both in linear and toroidal geometry. The influence of the injector position, voltage, current and other parameters were investigated.

39807 (IFVE-OKU-OUNK—84-23) Systems for damping the beam transverse dipole oscillations in the IHEP accelerator. Balbekov, V.I.; Gertsev, K.F.; Lebedev, O.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701645.

The development of the system for damping beam coherent transverse instabilities in the IHEP proton synchrotron is described. The system has continuously been modified starting from the moment when the first damping system was put into operation in 1973. A general calculational technique for these systems is given alongside with the description of the apparatus and their main characteristics.

39808 (IFVE-OMVT—84-92) Numerical simulation of oscillation fields with azimuthal variations in axially-symmetric resonators. 1. Formulation of the problem and the method of its solution. Anikeeva, V.A.; Fedoseev, A.I.; Gonin, I.V.; Paramonov, V.V.; Kaschiev, M.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701646.

This paper considers one of the formulations of the problem for numerical simulation by the finite element method at Hsub(r), Hsub(Z), (Esub(r), Esub(z)) electromagnetic field component representations which is free of potential solutions. A method to solve the arising generalized non-symmetric algebraic eigenproblem is proposed. The algorithms are realized in MULTIMODE-code. Examples demonstrate a possibility of high accuracy of computations.

39809 (IFVE-OUNK—84-28) Beam microwave instability in proton synchrotrons. Balbekov, V.I.; Ivanov, S.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 17p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701888.

A general criterion for longitudinal stability of a proton beam interacting with a narrow-band cavity is presented. The following two parameters are shown to affect the instability character in the near-threshold zone: bunch length in the cavity wavelength units and relative synchrotron frequency spread. The value of these parameters causes the excitation of the bunch oscillations of definite or several coupled multipoles. Special attention is given to the case when coupling of too many multipoles results in microwave bunched beam instability.

39810 (IFVE-OUNK—84-68) Interference of edge proton radiation in synchrotron dipole magnets. Smolyakov, N.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701644.

Submitted to the journal Sov. Phys. Tech. Phys. .

The interference of short wave edge radiation of a proton beam bunched on the adjacent edges of the synchrotrons dipole magnets is studied. The universality of the spectrum of interfering edge radiation is proved. The analytical formulas describing spectral and angular characteristics of radiation are obtained for the edge field of a smooth shape. Spatial resolution of beam monitors with the help of interfering edge radiation is determined. The conditions under which observation of the interference is possible are analysed.

39811 (ITEF—21(1984)) Accuracy of smooth approximation at calculating coulomb field effecting beam dynamics in a strong-focusing accelerator. Vorob'ev, I.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1984. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701889.

Results of numerical solution of equations for beam envelopes in strong-focusing channels at microcanonical distribution of phase density of beam current at different values of beam coulomb

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parameter are set forth. Basic parameters of a matched beam: transverse oscillations phase superposition in the focusing period, minimum frequency of transverse oscillations, matched initial conditions and mean beam radius are calculated by means of determined periodical solutions of these equations. The results of the calculation are compared with the analytical results obtained by formulae derived in smooth approximation for envelope equations. Conditions restricting the usage of these formulae for calculation of matched beam parameters are considered.

39812 (JINR—11-84-505) Numerical simulation of electron-ion beam dynamics. Perel'shtejn, Eh.A.; Shirkov, G.D.; Shchinov, B.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1984. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701891.

Submitted to the All-union conference on numerical methods and applications, NRB, Sep 1984.

The program is described for computer simulation of the processes in axial-symmetric many-component beams of charged particles by the larged particle method. Using the fast Fourier transformation the charged particle proper fields are defined with the mesh integration of the Poisson equations. Calculation of the ion accumulation processes in the electron beam are cited as the examples of the program using.

39813 (JINR—R-9-84-270) Nonlinear theory of relativistic electron beam interaction with a slow electromagnetic wave. Bonch-Osmolovskij, A.G.; Reshetnikova, K.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy; Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1984. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701647.

Submitted to the journal Sov. - Phys. - JETP.

Under definite conditions on the basis of anomalous Doppler's effect the relativistic electron beam interacts resonantly with a slow electromagnetic wave generated by an external source in the slowing-down structure. It is shown analytically and by numerical calculations that a strong periodical density modulation arises in the beam which runs along the beam axis with a velocity close to the phase velocity of external wave, and powerful electromagnetic wave is excited in the system. Its amplitude at moderated parameters of the beam and external wave may exceed the field, usually evaluated by electron wave capture. The Langmuir mode evolution in space and time are determined, and the characteristics of nonlinear quasistationary regime are determined. Analytical and numerical calculations have given similar results.

39814 (JINR—R-9-84-631) Investigation of the SILUND-20 electron linear induction accelerator beam. Dolbilov, G.V.; Lebedev, N.I.; Petrov, V.A.; Fateev, A.A.; Shchinov, B.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1984. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701890.

The results of investigating the electron beam in the SILUND-20 linear induction accelerator are presented. The interactive automated system permitting to measure pulse time and amplitude characteristics is used for these investigations. The beam emittance, centre of gravity position, beam dimensions and magnetization of the electron source plasma cathode are defined. The stability of accelerator characteristics and beam parameters are measured. The region of maximum stability is determined. The causes of parameter instability and the ways for their elimination are pointed out.

39815 (LBL—18954) Design of a three channel septum magnet. Milburn, J.; Porter, J.; Tanabe, J.; Caylor, R.; Reimers, R. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 5p. (CONF-850504—212). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015249.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

A three channel septum magnet has been designed to service the three primary beam lines at the exit of the SuperHILAC. A pulsed switching magnet located in the next to last drift tube in the SuperHILAC poststripper diverts the beam +-1.09° into either the north or south port of the septum magnet. The central channel allows an undiverted beam to pass into another distribution magnet downstream. All channels may be active simultaneously and each may be tuned independently. Each septum channel contains four separate field regions and bends the beam 14.91°. Various important aspects of the design, including geometry, material selection, thermal characteristics and power requirements, are discussed. 2 refs., 3 figs.

39816 (LBL—18960) Hybrid rare earth quadrupole drift tube magnets. Halbach, K.; Feinberg, B.; Green, M.I.; MacGill, R.; Milburn, J.; Tanabe, J. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—218). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015116.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

A prototype quadrupole permanent magnet with adjustable field strength has been constructed and tested. The magnet consists of iron pole pieces to provide the required field shape along with rare earth permanent magnet material (samarium cobalt) to energize the magnet. A unique feature of the configuration is the adjustability of the field by rotating the outer rings consisting of permanent magnets and iron. Magnetic tests show small field errors coming from well understood assembly details. Mechanical tests show the design needs further consideration to ensure reliability. It is planned to use this type of magnet in the SuperHILAC prestripper drift tubes. 3 refs., 5 figs.

39817 (LBL—18970) Two-dimensional linacs. Cooper, W.S.; Anderson, O.A. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—210). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015129.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

We describe several schemes for rf acceleration of ribbon beams. (Although the ribbon edges of course, need to be focussed, these configurations are essentially 2-D.) They allow simpler modeling than quadrupole systems and, if operable, provide good matching to certain types of ion sources and beam neutralizers. We discuss four possible configurations, in chronological order of conception: (1) an rf linac with dc transverse field focussing; (2) a similar linac, also with many pairs of electrodes, but using rf focussing; (3) an RFQ-like configuration with continuous electrodes, in which energy changes slowly along the beam axis; and (4) a similar system in which the beam energy oscillates along the axis. We discuss some of the advantages and disadvantages of these systems, and analyze the last case in some detail. 8 refs., 1 fig.

39818 (LBL—19485) Effect of induced charge at boundaries on transverse dynamics of a space-charge-dominated beam. Celata, C.M.; Haber, I.; Laslett, L.J.; Smith, L.; Tiefenback, M.G. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—219). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015128.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

A particle simulation code has been used to study the effect of transverse beam dynamics of charge induced on focusing electrodes. A linear transport system was assumed. The initial particle distribution was taken to be that of a uniform elliptical beam with a Gaussian velocity distribution. For misaligned, highly space-charge-dominated beams (betatron phase advance per lattice period $\lesssim 10°$), a large oscillation of the rms emittance occurred in a beat pattern. Linearized Vlasov analysis shows the oscillation to be a sextupole oscillation, driven by the beam coherent betatron motion. Emittance growth accompanied the oscillation. Preliminary experimental results from the Single Beam Transport Experiment (SBTE) are consistent with the code results. Addition of a dodecapole nonlinearity to the computational focusing field greatly reduces the oscillation amplitude.

39819 (LBL—19563) Synthesis of MBE-4 accelerating waveforms. Kim, C.H.; Brady, V.O.; Fessenden, T.J.; Judd, D.L.; Laslett, L.J. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 7p. (CONF-850504—229). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015280.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

An ion induction linac for HIF must operate near the space charge current limit along most of its length. Small errors in the voltages applied to the accelerating gaps can readily produce local unwanted beam bunching and consequent beam loss. Uncompensated space charge forces will generate current loss from longitudinal beam spreading. In the design of the MBE-4 ideal acceleration voltages were developed that assure self-similar amplifying current waveforms at each position along the accelerator. These were approximately synthesized by adding waveforms that can be obtained from realizable electrical pulsers. A code is used to study effects produced by the imperfect synthesis on the longitudinal ion dynamics and beam current waveforms in the presence of space-charge forces.

39820 (LBL—19564) Measurement of frequency response of LBL stochastic cooling arrays for TeV-I storage rings. Goldberg, D.A.; Lambertson, G.R.; Voelker, F.; Shalz, L. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—228). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015281.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Lawrence Berkeley Laboratory (LBL) has developed electrodes for the stochastic cooling system which is used in the antiproton source in TeV-I at Fermilab. The electrodes are in the form of a pair of stripline couplers or loops, the elements of which are mounted on opposite sides of the beam. We have made two different couplers of similar design, the one to operate in the frequency range 1-2 GHz, the other, 2-4 GHz. We have made two different types of measurements; the one involving the response of a single loop pair to a wire signal simulating the beam signal; the other, the response of a 16 loop-pair array to an actual beam. Both sets of measurements were made in the frequency domain, and both involved taking both the so-called sum and difference responses, in which the signals from the two elements of the loop pair are added and subtracted, respectively. The former response shows little variation as the beam or wire is displaced from the midplane of the loop-pair; the latter exhibits a roughly linear variation with displacement, and is used to detect the position variation of the particles in cooling systems. In general, the beam and wire measurements were found to be in excellent agreement.

39821 (LBL—19565) Sextupole correction coils for SSC model dipoles. Rechen, J.B.; Gilbert, W.S.; Hassenzahl, W.V. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—216). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015275.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Local correction of the sextupole error field is proposed for the dipoles of the SSC. This requirement is imposed on the design by the high field quality required both during injection at low fields and during colliding beam operation at high fields. Error fields in the main dipole windings due to superconductor magnetization and conductor misplacements and unwanted sextupole and decapole magnetic field terms. To correct the sextupole error field we have constructed sextupole coils made of a single layer of superconducting wire and have mounted them with high precision on the stainless steel bore tube. These correction coils have been operated with 1 meter long SSC model dipoles in both the self-powered and externally-powered modes. The sextupole field in the bore has been reduced by as much as a factor of 50. The level of correction depends strongly on the angular alignment of the correction coil with respect to the sextupole error field it is to correct. Results of tests, performance of the correction coils and alignment requirements for the system are presented.

39822 (LBL—19603) Feedback to suppress beam instabilities in future proton rings. Lambertson, G.R. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 8p. (CONF-850504—217). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015274.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Criteria for the design of feedback systems to suppress coherent beam instabilities are presented. These address starting amplitudes, diffusion from noise during damping or long storage, and choice of kicker. As a model for future accelerators, specifications of the proposed 20 TeV SSC are used to calculate parameters of systems to control expected instabilities. A scenario and hardware to stabilize the transverse mode-coupling instability is examined. The scale of the systems is large but not out of scale with the large ring. 9 refs., 4 tabs.

39823 (RAL—84-122) Saturation of plasma beat waves. Bingham, R.; Evans, R.G.; Cairns, R.A. (Rutherford Appleton Lab., Chilton (UK)). Dec 1984. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701892.

The authors analyze the saturation mechanism for the electrostatic plasma wave excited by two electromagnetic waves, and show that the level is determined not only by the relativistic frequency shift but also by the frequency shift produced by second harmonics of the electrostatic plasma wave. The frequency shift due to the higher harmonics dominates, with the frequency increasing rather than decreasing with amplitude. The positive frequency shift makes the wave stable to the development of strong turbulence. The analytical results are directly checked by numerical simulations carried out using a 1-D particle in cell code showing excellent agreement between the two approaches.

39824 (SAND—85-1338C) Laser-based foilless diode. Shope, S.L.; Frost, C.A.; Leifeste, G.T.; Crist, C.E.; Poukey, J.W. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 11p. (CONF-8506141—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013958.

From SDIO/DARPA annual propagation review; Monterey, CA, USA (24 Jun 1985).

A foilless diode usually requires an externally applied magnetic field to control expansion and transport of a relativistic electron beam. A new foilless diode has been developed that does not require an external magnetic field. A low pressure organic gas is introduced into the diode and the transport region. A uv laser beam is injected through the transport region and is terminated at the cathode. The laser photoionizes the low pressure gas forming an ionized channel that captures the electron beam near the cathode. The electron beam is focused and guided by electrostatic attraction to the ionized channel. A 1.5-MeV, 20-kA electron beam has been generated and transported 1 m using this technique.

39825 (SAND—85-1452C) RADLAC II lead pulse stability. Leifeste, G.T.; Mazarakis, M.G.; Ekdahl, C.A. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 5p. (CONF-8506141—6). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014462.

From SDIO/DARPA annual propagation review; Monterey, CA, USA (24 Jun 1985).

The goal of the RADLAC II lead pulse stability experiment is to demonstrate that a beam with current in excess of 40 kA is capable of propagating a substantial fraction of a Nordsieck length in full density air. The nominal RADLAC II beam parameters are 45 kA, 60-ns FWHM, and a beam radius of 0.8-1.0 cm radius. These parameters should enable us to observe the enhanced stability of high-current beams predicted by theory.

39826 (SLAC-CN—301) Beam emittance and beam disruption. Hollebeek, R.; Minten, A. (Stanford Linear Accelerator Center, CA (USA)). 1 Jun 1985. Contract AC03-76SF00515. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015136.

Beam disruption during the collision of intense relativistic bunches has been studied by R. Hollebeek. In the case of oppositely

charged bunches, focussing effects occur causing a decrease in the effective bunch cross section, and thereby an increase of luminosity by an enhancement factor H. The term disruption derives from the fact that the beam emittance changes markedly during the collision. 1 ref., 1 fig., 1 tab.

39827 (SLAC-CN—305) Disruption angles. Minten, A. (Stanford Linear Accelerator Center, CA (USA)). 25 Jun 1985. Contract AC03-76SF00515. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015138.

This investigation has been stimulated by the question, to what extent beam disruption of two penetrating SLC bunches will modify the initial angular distribution of the incident beam, and whether the tails of the outgoing beam will be significantly enhanced and will lead to increased losses in the vicinity of the detector. We try to answer this question in three steps. 6 refs., 4 figs., 4 tabs.

39828 (SLAC-PUB—3647) Some uses of REPMM's in storage rings and colliders. Spencer, J.E. (Stanford Linear Accelerator Center, CA (USA)). Apr 1985. Contract AC03-76SF00515. 4p. (CONF-850504—191). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014292.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Improvements for existing rings and techniques for building new rings composed entirely of passive, Rare Earth Permanent Magnet Multipoles (REPMM's) are considered using circular dipoles, quadrupoles and sextupoles. Over the past few years we have made such magnets using a single size $SmCo_5$ block with up to five easy-axis orientations. The final production scheme is modular in that magnets are built-up from quantized layers. All multipole layers are made in exactly the same way using algorithms differing only by the desired multipole symmetry. The method is simple, efficient and inexpensive and allows a "do-it-yourself" approach to constructing new magnetic elements. For rings these might include focusing optical klystrons, rotatable multipoles for diagnostics, correction or extraction, or possibly combined function systems for the unit cells. A high quality, low-beta, PMQ insertion which can change beta, tune and energy is described as well as the PMS's for the SD and SF elements of the North SLC damping ring. Because these sextupoles will be the first optical use of PM's in storage rings they are discussed in detail together with the advantages, problems and requirements of such applications. 8 refs., 4 figs.

39829 (UCRL—92673) Collective accelerator for electron colliders. Briggs, R.J. (Lawrence Livermore National Lab., CA (USA)). 13 May 1985. Contract W-7405-ENG-48. 5p. (CONF-850504—88). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012878.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

A recent concept for collective acceleration and focusing of a high energy electron bunch is discussed, in the context of its possible applicability to large linear colliders in the TeV range. The scheme can be considered to be a member of the general class of two-beam accelerators, where a high current, low voltage beam produces the acceleration fields for a trailing high energy bunch.

39830 Intense positron beams: linacs. Howell, R.H.; Alvarez, R.A.; Woodle, K.A.; Dhawan, S.; Egan, P.O.; Hughes, V.W.; Ritter, M.W. (Lawrence Livermore National Lab., CA). pp 155-163 of Positron scattering in gases. Humbertson, J.W.; McDowell, M.R.C. (eds.). New York, NY; Plenum Publishing Corporation (1984). Contract W-7405-ENG-48.

Beams of monoenergetic positrons with energies of a few eV to many keV have been used in experiments in atomic physics, solid-state physics and materials science. The production of positron beams from a new source, an electron linac, is described. Intense, pulsed beams of low-energy positrons were produced by a high-energy beam from an electron linac. The production efficiency, moderator geometry, beam spot size and other positron beam parameters were determined for electrons with energies from 60 to 120 MeV. Low-energy positron beams produced with a high-energy electron linac can be of much higher intensity than those beams currently derived from radioactive sources. These higher intensity beams will make possible positron experiments previously infeasible. 10 references, 1 figure.

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 39807, 39815, 39920, 40222, 40223

39831 (ANL/HEP-CP—85-40) Low cost/low intensity 50 MeV proton irradiation facility. Kramer, S.L.; Martin, R.L. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 3p. (CONF-850504—231). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014977.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Protons have been proposed as one of the most useful particles for radiation therapy, but have found limited use due to the cost and scarcity of medium energy proton accelerators. However, the highly successful program on the Harvard Cyclotron has increased interest in expanding the number of treatment facilities. In order to demonstrate that high intensity proton accelerators are not required and to gain experience with treating patients using protons, a low cost and low intensity source of 50 MeV protons was developed at Argonne. Although the beam penetration is limited to 22 mm, the beam is capable of treating a major fraction of the ocular melanoma tumors treated at the Harvard Cyclotron. This beam operates parasitically with the Rapid Cycling Synchrotron at Argonne using a source of 50 MeV H^0 atoms which are produced by stripping in the gas of the 50 MeV H^- linear accelerator. A stripping fraction of about 3 to 5 x 10^{-5} is observed and yields a 0.4 namp beam of protons. Results on the properties and operation of this parasitic beam are presented. 5 refs., 3 figs.

39832 (BNL—34518-Ed.2) AGS experiments: 1983, 1984, and 1985. Second edition. Bunce, G. (Brookhaven National Lab., Upton, NY (USA)). Jan 1985. Contract AC02-76CH00016. 86p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85014822.

The report contains the layout of experimental areas, a table of beam parameters and fluxes, the experiment schedule "as run", the experiment long range schedule, a listing of experiments by number, and a series of two-page summaries of the experiments. (GHT)

39833 (BNL—36605) LEGS data acquisition facility. LeVine, M.J. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 3p. (CONF-850579—11). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012260.

From 4. topical conference on computerized data acquisition in particle and nuclear physics; Chicago, IL, USA (19 May 1985).

The data acquisition facility for the LEGS medium energy photonuclear beam line is composed of an auxiliary crate controller (ACC) acting as a front-end processor, loosely coupled to a time-sharing host computer based on a UNIX-like environment. The ACC services all real-time demands in the CAMAC crate: it responds to LAMs generated by data acquisition modules, to keyboard commands, and it refreshes the graphics display at frequent intervals. The host processor is needed only for printing histograms and recording event buffers on magnetic tape. The host also provides the environment for software development. The CAMAC crate is interfaced by a VERSAbus CAMAC branch driver.

39834 (CONF-850470—6) Charge-state distributions of 100, 175, 275, and 352 MeV gold ions emerging from thin carbon foils. Martin, J.A.; Auble, R.L.; Erb, K.A.; Jones, C.M.; Olsen, D.K. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 17p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014651.

From 4. international conference on electrostatic accelerator technology and associated boosters; Buenos Aires, Argentina (15 Apr 1985).

These measurements were undertaken as a consequence of our failure early this year to accelerate Au^{+46} ions in the Oak Ridge Isochronous Cyclotron using an injected beam of 352 MeV

$^{197}Au^{+17}$ from the 25 MV tandem accelerator. Following that unsuccessful test, we made a preliminary measurement of the charge-state distribution of 352 MeV ^{197}Au ions emerging from a carbon foil using the bending magnet that is a part of the cyclotron beam injection system. The measured mean charge was ~38.5, about 4.5 charge-states lower than predicted by the Sayer semi-empirical formula. The measurements reported here were done more precisely and systematically confirm that preliminary result. 12 refs., 5 figs., 4 tabs.

39835 **(DOE/ER/05940—T1) Accelerator research studies.** (Maryland Univ., College Park (USA)). Nov 1983. Contract AS05-78ER05940. 75p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85014878.

During the past contract period, major progress was made in both tasks of the accelerator research program in the Charged Particle Beam Laboratory at the University of Maryland. The major event in Task A was the completion of phase two of the transport channel. This phase consists of 12 lenses in addition to the two matching lenses. The first measurements of beam transport indicate 100% beam transmission in the range $40^0 < \sigma_0 < 90^0$. Major highlights in Task B were new results in collective acceleration from laser-produced plasmas (considerably higher ion energies and currents than reported previously), successful studies of electron beam propagation in drift-tube and helix structures, construction of a novel, compact pulse-powered generator as well as new ion and electron spectroscopy results in the plasma focus area.

39836 **(FEI—1541) Study on characteristics of a high-frequency ion source for an electrostatic accelerator.** Bazhal, S.V.; Nikitin, V.A.; Romanov, V.A.; Ovcharenko, S.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1984. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701893.

The effect of a parameters of a power supply of a high-frequency ion source applied in electrostatic accelerators: such as: high-frequency discharge power, working gas feed, extraction voltage on phase characteristics and mass composition of a beam is investigated. Projections of transverse phase volume obtained at optimum operating regimes of the inon source for beam currents equal to 32, 52, 72 μA are presented. Beam emittance of 15 keV particles is shown to vary in the 8-26 mmxmrad range and brightness - in the 0.6-2.5 $\mu A/mm^2$xmrad range versus regimes of power supply. The square of the projection of the transverse phase volume increases with the growth of beam current. Monotonous increase of beam brightness and decrease of emittance correspond to increase of working gas feed at constant beam current. Mass composition is different in the beam cross section.

39837 **(IFVE-OKU—84-89) Septum magnet for proton extraction system at the IHEP accelerator.** Ado, Yu.M.; Lyudmirskij, Eh.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701897.

The paper gives a description of the suptum magnet SM for proton slow extraction from the IHEP synchrotron. The SM excitation coil and magnetic core are assembled outside the accelerator vacuum system. The SM is reliable in operation, can be adjusted with a high accuracy with respect to the accelerated beam, moreover it has a low outgassing in the vacuum under residual gas pressure up to $1.35\ 10^{-8}$. The SM has operated $8\ 10^5$ cycles.

39838 (INIS-mf—9299, pp 79-83) **Ultra-relativistic collisions of heavy ions.** Baym, G. (Illinois Univ., Urbana (USA). Dept. of Physics). 1984. NTIS (US Sales Only), PC A10/MF A01. File Number DE85780947. (CONF-840166—).

From 12. international workshop on gross properties of nuclei and nuclear excitations; Hirschegg, Austria (16 Jan 1984).

The U.S. Nuclear Science Advisory Committee decided recently to pursue the construction of an ultra-relativistic heavy-ion collider. Here I review some of the physics motivations for this project, and discuss parameters for the design of such a machine.

39839 (INIS-mf—9482, pp 39) **Contribution to spectrometry of betatron bremsstrahlung.** Hrabovcova, A.; Nikodemova, D. (Vyskumny Ustav Preventivneho Lekarstva, Bratislava (Czechoslovakia)); Laginova, V. (Ustav Klinickej Onkologie, Bratislava (Czechoslovakia)). Aug 1983. (In Slovak). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

39840 **(ITEF—2(1984)) Potentialities of a plasma produced by CO_2-laser being a multicharged ion source.** Latyshev, S.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1984. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701895.

To develope the intense source of multicharged heavy ions for the driver of heavy-ion inertial fusion possibilities of laser sources of multicharged ions are considered. Charge composition, the number and phase volume of multicharged ions in a plasma, produced by CO_2-laser radiation are investigated theoretically. It is shown that laser plasma produced by long-wave length radiation of CO_2-laser is the intense source of multicharged ions with z=2-15. The use of frequency CO_2-lasers operating with 100-1000 Hz pulse repetition rate enables to achieve the emission of multicharged ions equal to 10^{17}-10^{18} particle/s, which exceeds by several orders all multicharged ion sources available at present. Potentialities of laser plasma being multicharged ion source will be realized more completely if plasma scattering for large distances is conducted in microwave waveguide where plasma heating is accomplished by means of an electromagnetic wave with 1-10 GHz and 2-100 W. It enables to increase the yield of multicharged ions by one-three orders due to complete removal of recombination losses of multicharged ions during laser plasma scattering. Thin supersonic gas jets are used as targets. It enables to remove low charged ions in scattered laser plasma which are produced at the stage of heating from laser pulse tail as well as in a cold supercritical area.

39841 **(ITEF—105(1983)) Calculation of active losses and accumulated energy in a cylindrical resonator with drift tubes.** Illarionova, N.S.; Lipkin, I.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1983. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701884.

Calculations of energetics of a cylindrical resonator with drift tubes inserted along the axis are given. Results of calculations of high-frequency energy accumulated in resonator volumes and active losses in the walls of resonator and drift tubes are presented as well. Algorithm realizes the method of partial regions and is based on solution of reduced system of equations for electromagnetic fields expanded in eigenfunctions of each of partial regions.

39842 **(ITEF—175(1983)) Formation of ion charge spectra of laser plasma of gas targets.** Golubev, A.A.; Krechet, K.I.; Latyshev, S.V.; Sharkov, B.Yu.; Shumshurov, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1983. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701894.

Formation of charge composition of expanding laser-produced plasma of gas targets is considered experimentally and theoretically. It is shown that for obtaining a narrow, bell-like ion distribution versus charges it is necessary to use a thin supersonic gas target, with the plasma break and ion extraction being exersized at possibly smaller distances from the laser target.

39843 (JAERI-M—84-010, pp 312-317) **JAERI Tandem neutron TOF spectrometer.** Sugimoto, Masayoshi; Yamanouti, Yoshimaro (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Mar 1984. (In Japanese). JAERI-Tokai-Mura, Naka-gun, Ibaraki-ken, 319-11, Japan. File Number TI84901547. (CONF-8311187—; NEANDC(J)—97/AU; INDC(JPN)—84/G).

From JAERI seminar on nuclear data; Tokai, Japan (30 Nov 1983).

The layout of the neutron TOF spectrometer at JAERI Tandem Accelerator for the scattering measurement in 10-40 MeV and the data acquisition/process system are described. The result of the $^{28}Si(n,n)$ and (n,n') at En=13 MeV is shown and the great improvement of the counting efficiency is obtained.

39844 **(JINR—9-84-480) Investigation of ion beam extraction from the U-400 cyclotron by the stripping method.** Gul'bekyan, G.G.; Morduev, A.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1984. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701899.

The extraction and transport of ions in a wide energy range along the same ion channel from the U-440 cyclotron are investigated. The approximation of radial distribution of the cyclotron magnetic field by polynomials using the least square method is used in the programs for calculating extraction parameters. Sizes, position of centres of extracted beams and direction of ion velocity vectors versus foil azimuth are determined. The calculations were carried out for stripping coefficients 3; 3.5; 4 within the 1.40-1.75 m range of extraction radii. The effect of correcting magnets, compensating and focusing channels on the extraction efficiency is investigated. The theoretical and experimental results are compared. The investigations performed permit to optimize the system of ion extraction from the U-400 cyclotron and point out the ways to extend the range of ions and energies.

39845 **(JINR—9-84-555) Heavy ion cyclotron facility of the Laboratory of Nuclear Reactions of JINR.** Flerov, G.N.; Oganesyan, Yu.Ts.; Bogomolov, S.L. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1984. 59p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE85701900.

The cyclotron facility of the Laboratory of Nuclear Reactions designed to accelerate ions of all elements of the Mendeleev Periodic Table to 20-120 MeV/nucleon energies is described. This facility consists of two isochronous cyclotrons with 4 m pole diameters. The U-400 is the injector of the basic U-400M cyclotron, which will be constructed on the base of electromagnet of the classical U-300 cyclotron. Ion acceleration will be performed in two stages: at first, to 1.7-2.5 MeV/nucleon at the U-400 cyclotron, and then, after extraction and charge exchange to increase the ion charge by a factor of 4-8, at the main accelerator U-400M. The physicotechnical justification and the main parameters of the accelerator system are given.

39846 (JINR—D-7-83-644, pp 531-536) **Status and prospects of development of heavy ion accelerators of the JINR Laboratory of Nuclear Reactions.** Oganesyan, Yu.Ts.; Gul'bekyan, G.G.; Gikal, B.N. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The U-200, U-300, U-400 cyclotrons are described, intensities of beams of these cyclotrons are given. At present acceleration of ion beams with the mass from 16 to 80 is performed at the U-400 cyclotron. Beam extraction is accomplished using the method of beam stripping on thin foils (approximately 50 $\mu g/cm^2$) with the possibility of energy variation by radial and azimuthal foil position at a fixed level of magnetic field. The formation of magnetic field distribution provides stable acceleration of ions in a wide range of $A/Z = 4\text{-}25$ up to energies of 400-675 Z/A MeV. The construction of accelerating complex designed for production of ions from oxygen to uranium with energies of 20-120 MeV/nucleon and intensity of 5×10^{12} - 10^{11} s^{-1} is planned. The accelerating complex will comprise the U-400 preaccelerator and the U-400 M postaccelerator based on the U-300 cyclotron.

39847 (JINR—D-7-83-644, pp 537-545) **Development of the synchrophasotron as the relativistic and polarized nuclei accelerator.** Semenyushkin, I.N. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Experiments on the production of beams of light nuclei and polarized deuterons performed at JINR synchrophasotron are described. Comissioning of the new injection complex permitted increasing proton energy up to 20 MeV, proton beam current up to 50 mA/pulse and to increase the energy of nuclei up to 5 MeV/nucleon. The main parameters of the ion source KRYON-1 that operated on the accelerator about 4000 hours without serious failure are presented. The source can deliver nuclei up to Ne^{10+}. At the source of polarized deuterons POLARIS an accelerated deuteron beam with the intensity of 6×10^8 part./pulse is obtained and extracted from accelerator. The use of modernized accelerating HF-system has permitted to increase the intensity of protons accelerated up to 10 GeV and nuclei accelerated up to 4.1 GeV/nucleon. The beamline system is presented. Recently the accelerator has operated five performances, about 4000 hours a year. About 70% of time of accelerator operation is devoted to acceleration of nuclei. In the current five years modernization of synchrophasotron as accelerator of relativistic and polarized nuclei will be continued.

39848 (JINR—D-7-83-644, pp 546-550) **Postacceleration system of the tandem accelerator of the Institute for Physics and Nuclear Engineering.** Indreash, G.; Papureanu, S. (Institutul de Fizica si Inginerie Nucleara, Bucharest (Romania)). 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

A postacceleration system is described which is being built in the Institute of Physics and Nuclear Technology in Bucharest. The postacceleration system is hybride one and consists of tandem accelerator (injector) and 20 individually phased quater-wave spiral resonators which form the postaccelerator. The total energy gain during operation of all 20 resonators is 6 MeV/charge. At the first stage the postaccelerating system will permit to advance into the field of heavy masses and to achieve energies surpassing the Coulomb barrier in reactions on nuclei with mass A = 60 - 70.

39849 (JINR—D-13-84-53, pp 155-159) **Voltage-controlled power supplies in nuclear physics experimental arrangements.** Gleisberg, F.; Meiling, W. (Technische Univ., Dresden (German Democratic Republic)). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

Some types of power high-voltage supply sources with controlled voltage are described. The sources are developed on the base of bipolar high-voltage switching transistors in the collector circuit. The supply sources of 50 W - 1 kW are developed for high-voltage ion sources. High-voltage supply sources are characterized by output voltage of 10 kV, output current of 10 mA, stability - 0.1%, instability less than 10^{-4}, 120x215x220 mm dimensions. Voltage amplifiers of other types are calculated for 25 kV and 4 mA.

39850 (JINR—D-13-84-53, pp 221-223) **Analyzing mode of the automatization parameter control system of the U-400 cyclotron.** Sukhov, A.M.; Kuznetsov, A.N.; Mel'nikova, L.M.; Pashchenko, S.V.; Subbotin, V.G.; Fefilov, B.V. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The automatization parameter control system of the isochronous cyclotron (APCS-U-400) is described. It comprises two KM 001 microcomputers, one of which performs scanning and measuring of different accelerator parameters, processing of acquired data and its presentation on the TV display screen in a convenient for the operator form (tables, plots, mimic panels). The second microcomputer establishes communication with external acquisition de-

vices by the direct computer access channel. The function of the second microcomputer is preparation and data output to DZM-180 mosaic press documenting the quality of the accelerator operation. The analysing mode which permits to perform measurement of one of basic parameters-accelerated ions energy has been put as well in the second microcomputer.

39851 (JINR—D-13-84-53, pp 116-120) **Amplifiers for operation at 4.2 K.** Man'yakov, P.K.; Tlachala, V.; Tykarski, L. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The results of investigations of field transistors behaviour at low temperatures are presented. The transistors are used in fast-response pulse amplifiers of the data read-out system with pick up-electrodes of the superconducting magnet accelerator. Static volt-ampere characteristics of the transistors tested at 300, 77 and 4.2 K are given. Amplifier circuits with the following advantages are presented: high speed in response (time of adjustment less than 3 ns), high input resistance (4 MΩ), power amplification $2x10^2$. The transistors have shown high reliability of performance under all testing conditions.

39852 (JINR—D-13-84-53, pp 376-380) **Computerized system for the U-400 isochronous cyclotron parameter monitoring (ASKP U-400).** Fefilov, B.V.; Subbotin, V.G.; Sukhov, A.M.; Mel'nikova, L.M.; Pashchenko, S.V.; Fomenko, B.A. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The computerized system for the U-400 isochronous cyclotron parameters monitoring is briefly described. The system ensures acquisition and measurement of basic parameters with the purpose of diagnosis of the state of accelerator systems and tracing of heavy ions output beam to the experimental equipment. The system is based on parallel operation of two KM001 microcomputers monitored from the keyboard of one alpha-numeric display MERA 7953. The first microcomputer is directly coupled with the display. The interactive coupling with the second microcomputer is realized through the first microcomputer, CAMAC bus and interface. The first microcomputer is used for data commutation, measuring and presentation on the display screen. The second one controls data acquisition and output.

39853 (JINR—D-13-84-53, pp 448-451) **Multicomputer complex for applied problems and automatization of heavy ion accelerator experiments.** Fefilov, B.V.; Vakatov, V.I.; Gorshkov, V.A. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The multicomputer complex for automatization of heavy ion accelerator experiments is described. The complex, representing a local computer network, consists of three basic parts. The first part - SM-4 and TPA-1140 computers, is used for centralized servicing U-400 accelerator experiments on line with experimental facilities and for data processing from computers of measuring modules (MM). The second part - SM-3 and TPA 1140-computers, is used for centralized servicing U-200 and U-300 accelerator experiments on line with experimental facilities. The third part - different microcomputers, is used for designing independent MM of experimental facilities. Each MM in addition to the computer comprises CAMAC electronics and performs selection, acqUisition preliminary processing and visualization of experimental data, array output onto computer carriers as well as experimental facility control. The system software is based on DOS PT-11 and PX-11 M. The data transmission rate by communication lines is 1.25 Mbit.

39854 (JINR—R-1-83-519) **Medium-size polarized deuteron target.** Polyakov, V.V.; Kovalev, A.I.; Trautman, V.Yu.; Kozlenko, N.G.; Kiselev, Yu.F.; Bunyatova, Eh.I.; Borisov, N.S.; Verner, K. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701904.

Submitted to the journal Nucl. Instrum. Meth. Phys. Research.

A frozen polarized deutron target made of high deuterium content ethanediol is described. Analytical expressions are obtained for the NMR spectrum correction for non-linearity of the Q-meter and a method for determination of the spectrum asymmetry is devised. The experimental results conform the theory of thermal mixing of deutron and proton spin systems with dipole-dipole reservoir of electron spins.

39855 (JINR—R-9-84-254) **Study on characteristics of valves for pulsed gas feed into a cyclotron multicharged ion source.** Bogomolov, S.L.; Efremov, A.A.; Koval'chuk, I.M.; Kutner, V.B.; Pasyuk, A.S. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701896.

Submitted to the 6. All-union symposium on ion source, Kiev, 1984.

Different valves (with rotating drum, piezoelectric and electromagnetic) for pulsed gas feed into cyclotron multicharged ion arc source are described. It is shown that piezoelectric and electromagnetic valves provide a possibility of regulating in a wide range the gas flow pulse parameters.

39856 (JINR—R-9-84-594) **Preliminary investigations of the JINR phasotron beam spill system.** Vorozhtsov, S.B.; Dmitrievskij, V.P.; Zaplatin, N.L.; Kol'ga, V.V.; Polferov, Eh.A.; Chesnov, A.F. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701898.

Experimental investigations of the JINR phasotron beam spill system are described. Magnetic field characteristics of the peeler and the regenerator providing a required turn separation (approximately 2cm) without essential increase of the beam axial dimensions are given.

39857 (JINR—R-13-84-59) **Liquid tritium target with temperature variation in the $20.6 < T < 40$ K range.** Bystritskij, V.M.; Voznyak, Ya.; Gula, A.; Dzhelepov, V.P.; Zinov, V.G.; Lontski, Eh.; Stolupin, V.A.; Shamsutdinov, Sh.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701905.

Submitted to the journal Instrum. Exp. Tech. .

The design of a liquid-tritium target with temperature variation in the $20.6<T<40K$ range is described. The target was constructed for the investigation of μ-atomic and μ^- molecular processes in pure tritium and mixtures of hydrogen isotopes. The temperature stability within +-0.2K required in such experiments over long expositions 300-400 h in muon-beam with the described design of the cryostatic target is secured.

39858 (KIYI—83-14, pp 20-25) **System of the electron collimation and beam diagnostics on the U-240 cyclotron.** Vasil'ev, Yu.O.; Kozyr', Yu.E.; Medvedev, V.I.; Pugach, V.M. 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780969.

In Equipment for the nuclear and physical experiment on the isochronous cyclotron U-240 in 1982.

The electron collimation and beam diagnostics system is described that has been tested using the α-particle beam of the U-240 cyclotron. The system operation creates necessary prerequisites for its application for the accelerator beam automated control. Its use can be especially efficient in organizing low-background and polarization experiments.

39859 **(LA—10448-MS) Power deposition measurements at the LAMPF Neutron Radiation Effects Facility.** Brown, R.D. (Los Alamos National Lab., NM (USA)). Jun 1985. Contract W-7405-ENG-36. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015355.

A calorimeter has been used in the LAMPF A-6 neutron radiation effects area to measure the power deposition about 20 cm from the isotope production targets. The measured value is about 2 w/cm³/mA, in reasonable agreement with previously calculated values. 3 refs., 3 figs.

39860 **(LA-UR—85-2057) 10-MHz high-voltage modulator with pulse-width and repetition-rate agility.** Krausse, G.J. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 7p. (CONF-850616—58). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014117.

From 5. IEEE pulsed power conference; Washington, DC, USA (10 Jun 1985).

Requirements for control and rapid switching of the proton beam at the Los Alamos Meson Physics Facility (LAMPF) are continually revised to support accelerator upgrades and modifications. A recent upgrade required the development of a 10-MHz high-voltage modulator for an electrostatic kicker with real-time control of pulse width and repetition rate over a range of four decades. The modulator must be capable of producing a voltage pulse across a capacitive load with a rise time of ≤20 ns (10% to 90%). In addition the falling edge undershoot must be controlled to less than one part in 10^3. The paper describes in detail the circuit design philosophy, layout, and critical areas in system design.

39861 **(LA-UR—85-2192) Remote recovery of irradiated tensile samples incapsulated in Pb-Bi.** Nicol, A.G.; Brown, R.D.; Cook, J.H. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 6p. (CONF-851115—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014090.

From American Nuclear Society winter meeting; San Francisco, CA, USA (10 Nov 1985).

The Swiss Institute for Nuclear Research (SIN) is upgrading their proton accelerator to 1 to 2 mA Beam current at 600 MeV. Molten Pb-Bi is being considered as a beam stop. The materials in the beam stop must be chemically compatible with molten Pb-Bi, retain ductility and strength, and have a lifetime of at least six months. In a joint venture between the United States and SIN, four capsules were designed and loaded with eight tensile samples. The tensile samples were Ta, Cr (Fe-2 1/4% Cr-1% Mo), Fe, and HT (Fe-12%, Cr-1% Mo). The cavity of the capsule was then filled with a molten Pb-Bi alloy so it would surround the tensile samples. The capsule lids were then welded in place. The capsules were irradiated in the proton beam at the Los Alamos Meson Physics Facility (LAMPF). The LAMPF facility was used because of its similarity to the proposed SIN upgrade. The LAMPF 800 MeV proton beam passing through the capsules subjects the Pb-Bi and tensile samples to temperatures between 350 to 400° centigrade. These temperatures were verified with melt wires placed in previous irradiation experiments. The Pb-Bi is molten at operating temperatures and tests the compatibility of the tensile samples with molten Pb-bi. Through transmutation by irradiation, Po-210 and Hg were produced. The containment of these toxic isotopes was a major concern during the planning for the disassembly of this experiment.

39862 **(LA-UR—85-2225) Review of proposed kaon factory facilities.** Macek, R.J. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 32p. (CONF-8503120—5). NTIS, PC A03/MF A01; GPO Dep. File Number DE85014080.

From Hadronic probes and nuclear interactions conference; Tempe, AZ, USA (11 Mar 1985).

A number of proton accelerator facilities, popularly called "Kaon Factories," have been proposed to extend the intensity frontier from about 1 GeV to higher energies in the range of 15 to 45 GeV. Seven proposed facilities - LAMPF II, TRIUMF II, SIN II, AGS II, KEK, MUNICH, and KYOTO - are reviewed with emphasis on capabilities of the experimental facilities. Costs and the choice of energy and current are also discussed. 7 refs., 29 figs., 7 tabs.

39863 **(LAL—84-40) Phase setting of radiofrequency fields in LEP injector linear accelerators.** Plouviez, E. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire; Paris-6 Univ., 75 (France)). Dec 1984. 118p. (In French). NTIS (US Sales Only), PC A06/MF A01. File Number DE85751936.

In this thesis we present a system used to perform automatic measurement and setting of the accelerating RF phase with respect to the phase of the particles accelerated in the LIL preinjector linacs of LEP and a quick commutation between the settings for positrons production and electron production. A microprocessor calibrated phase detection system operating in S band has been developed. This system measures the phase of 10 ns to 1 μs wide, 2998.55 mHz RF pulses with respect to a reference signal. The precision and reproductibility of the measurements is a few degrees at 100 Hz repetition rate. The commutation between the phase setting from positron production to electron production is less than 120 ms.

39864 **(LBL—18939) Achievement of Bevalac rapid mode switching.** Lothrop, F.; Stevenson, R.; Miller, R.; Alonso, J. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—220). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015130.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Rapid changes of ion, intensity, beam line, and output energy between two modes have been achieved. The techniques for switching among the Bevalac's several injectors are described. Energy level limits at the output (for $q/A = 1/2$) are 470 to 2100 MeV/n (high power) or 50 to 1050 MeV/n (low power). Depending on specific field value differences, the total time required for a mode change is less than one minute. This mode of operation greatly improves program efficiency in interleaving medical and nuclear science programs at the Bevalac.

39865 **(LBL—18958) Sources of radioactive ions.** Alonso, J.R. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 7p. (CONF-850504—213). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015251.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Beams of unstable nuclei can be formed by direct injection of the radioactive atoms into an ion source, or by using the momentum of the primary production beam as the basis for the secondary beam. The effectiveness of this latter mechanism in secondary beam formation, i.e., the quality of the emerging beam (emittance, intensity, energy spread), depends critically on the nuclear reaction kinematics, and on the magnitude of the incident beam energy. When this beam energy significantly exceeds the energies typical of the nuclear reaction process, many of the qualities of the incident beam can be passed on to the secondary beam. Factors affecting secondary beam quality are discussed, along with techniques for isolating and purifying a specific secondary product. The ongoing radioactive beam program at the Bevalac is used as an example, with applications, present performance and plans for improvements.

39866 **(LBL—18961) On-line velocity measurements using phase probes at the SuperHILAC.** Leemann, B.; Brodzik, D.; Feinberg, B.; Howard, D. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—226). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015279.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Phase probes have been placed in several external beam lines at the SuperHILAC to provide velocity measurements independent of the type of particle being accelerated. The system uses three probes in each line to obtain accurate velocity measurements at all beam energies. Automatic gain control and signal analysis are performed so that the energy/nucleon along with a representative probe signal are displayed on an oscilloscope every eight seconds. The system is accurate to within about +-0.25%, and has provisions for on-line calibration tests. The phase probes thus provide a velocity measurement independent of the mass defect associated

with the use of crystal detectors, which can become significant for heavy elements. 1 ref., 3 figs.

39867 **(LBL—18964) Improved Bevatron local injector ion source performance.** Stover, G.; Zajec, E. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—221). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015271.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Performance tests of the improved Bevatron Local Injector PIG Ion Source using particles of Si 4^+, Ne 3^+, and He 2^+ are described. Initial measurements of the 8.4 keV/nucleon Si 4^+ beam show an intensity of 100 particle microamperes with a normalized emittance of .06 π cm-mrad. A low energy beam transport line provides mass analysis, diagnostics, and matching into a 200 MHz RFQ linac. The RFQ accelerates the beam from 8.4 to 200 keV/nucleon. The injector is unusual in the sense that all ion source power supplies, the ac distribution network, vacuum control equipment, and computer control system are contained in a four bay rack mounted on insulators which is located on a floor immediately above the ion source. The rack, transmission line, and the ion source housing are raised by a dc power supply to 80 kilovolts above earth ground. All power supplies, which are referenced to rack ground, are modular in construction and easily removable for maintenance. AC power is delivered to the rack via a 21 kVA, 3-phase transformer. 2 refs., 5 figs., 1 tab.

39868 **(LBL—18965) Versatile rf controller.** Howard, D. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—222). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015273.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

The low level rf system developed for the new Bevatron local injector provides precise control and regulation of the rf phase and amplitude for three 200 MHz linac cavities. The main features of the system are: extensive use of inexpensive, off-the-shelf components, ease of maintenance, and adaptability to a wide range of operation frequencies. The system utilizes separate function, easily removed rf printed circuit cards interconnected via the edge connectors. Control and monitoring are available both locally and through the computer. This paper will describe these features as well as the few component changes that would be required to adapt the techniques to other operating frequencies. 2 refs.

39869 **(LBL—18967) Initial operation of the new Bevatron local injector.** Staples, J.; Dwinell, R.; Gough, R.; Halliwell, J.; Howard, D.; Lax, J.; Lundgren, S.; Richter, R.; Stover, G.; Tanabe, J. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 5p. (CONF-850504—230). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015206.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Initial operational characteristics of a new Bevatron injector system are described. It is capable of providing an independent source of ions to the Bevatron through mass 40. The new injector consists of a sputter ion PIG source, operating on a 60 kV dc platform, an RFQ linac, and two Alvarez linacs, all operating at 199 MHz. Beams with $q/A \geqq 0.14$ are accelerated to 200 keV/n in the RFQ and to 800 keV/n in the first Alvarez tank. Each Alvarez operates in the $2\beta\lambda$ mode, and each is followed by a foil stripper. Beams with a $q/A \geqq 0.32$ are accelerated through the second Alvarez to 5 MeV/n, fully stripped, and injected into the Bevatron. Because the Bevatron can be efficiently switched between this injector and the SuperHILAC injector, a more efficient operations schedule is made possible to meet the increasingly diverse needs of the Biomedical and Nuclear Science research programs. 5 refs.

39870 **(LBL—19011) Electron-spin-polarized targets for a collisionally-pumped polarized-ion source.** Kaplan, S.N.; Burrell, C.F.; Pyle, R.V.; Ruby, L.; Schlachter, A.S.; Stearns, J.W. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—227). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015276.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

Collisional pumping has been proposed as a mechanism for producing polarized ion beams more intense by orders of magnitude than those from the best existing sources. One implementation of this method employs a very thick electron-spin-polarized alkali-vapor target in a low magnetic field, and is characterized by a predicted 100% spin-transfer efficiency from the target to the beam. Target characteristics and design constraints are discussed.

39871 (NAC-AR—84-01, pp 76-82) **Report of the Accelerator Group: the control system.** 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780939.

In Annual report June 1984.

The control system of the NAC accelerators is being designed around a number of 16-bit minicomputers, 8-bit microcomputers and the CAMAC Fisher System Crate interfacing equipment. Most of the major software and hardware systems relating to the control system have been developed and software development for the direct control of the accelerators has commenced. The microprocessor applications include the following: ion source, radial probe and puller safety interlocking system; SSC power supply control; NMR facility; RF system; vacuum system.

39872 (NAC-AR—84-01, pp 153) **Report of the Van de Graaff Group: the 6 MV Van de Graaff Accelerator.** 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780939.

In Annual report June 1984.

The operation and maintenance of the Van de Graaff accelerator is discussed. Research groups from several universities and research institutions make use of the accelerator facilities. Most of the time required for maintenance (about 15% of the total running time) was taken up by routine ion-source changes and the subsequent conditioning up to operating voltages.

39873 (NAC-AR—84-01, pp 236) **Report of the Van de Graaff Group: data acquisition and processing.** 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780939.

Short note.

In Annual report June 1984.

39874 (NAC-AR—84-01, pp 41-75) **Report of the Accelerator Group: the separated-sector cyclotron.** 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780939.

In Annual report June 1984.

With the delivery to the NAC site of sector magnet SM2, and the assembly of the pole packages for SM2 and SM4, construction of all four magnets for the SSC was completed successfully. Much time was spent on magnetic field measurements and field mapping. The following aspects are discussed: radio-frequency system, SSC resonators, vacuum system, beam injection, beam extraction and beam diagnostics.

39875 (NAC-AR—84-01, pp 83-108) **Report of the Accelerator Group: the beam transport system.** 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780939.

In Annual report June 1984.

According to the report the assembly of the transfer beamline between SPC1 and SSC is well in progress, and all dipole and quadrupole magnets have been mounted, excepting the last 5 quadrupoles. The first diagnostic chambers have been aligned and the diagnostic equipment for the first section of the transfer beamline was put in place. The rotating-coil harmonic analyser has been used successfully to measure the harmonic content of the 20 quadropole magnets for the transfer beamline, and for precise location of the magnetic centre of these magnets. The interactive graphics version of the program TRANSPORT has been completed except for the implementation of hard-copy routines for the new plotter.

39876 (NAC-AR—84-01, pp 4-40) **Report of the Accelerator Group: the light-ion injector.** 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780939.

In Annual report June 1984.

Good progress was made on the various sub-systems of the light-ion injector cyclotron SPC1. The radio-frequency system, which consists of the two resonators (each with a 25 kW power amplifier) and the stabilization and control system was completed. Orbit calculations were used to determine the phase selection attainable from the combined axial and radial slits, and also to give an indication of the momentum selection which could be achieved using the radial slits. The detail design of all the extraction elements, i.e. the eletrostatic extraction channel EEK and two magnetic channel MEK1 and MEK2 has been completed. On the 15th December 1983, the first beams of ions were accelerated in SPC1. The following subsystems of SPC1 are discussed: magnets, radio-frequency systems, orbit calculations of the phase section, extraction process, vacuum system and beam diagnostics.

39877 (NAC-AR—84-01, pp 119-126) **Report of the Accelerator Group: electrical engineering.** 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780939.

In Annual report June 1984.

The Electrical Engineering Division of the NAC is involved in many aspects of the work on the various accelerators, notably the acquisition and testing of power supplies for the numerous magnets, and the design and construction of interfaces and drivers required for special applications. The projects that are discussed in the report include the ones on power supplies, a temperature gauge for the cryopumps, the fast stepping-motor drivers and the high voltage power supplies.

39878 (NAC-AR—84-01, pp 109-118) **Report of the Accelerator Group: mechanical engineering.** 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780939.

In Annual report June 1984.

The report describes the major components which have been designed during the year. This includes the following components for SPC1: the magnet channel MEK2; the electrostatic extraction channel, and the co-ordinate encoder (x,y). The components designed for the SSC include: the coupling capacitor; the septum magnet SPM1; short circuit plates and driving mechanisms; resonator trolleys; injection and extraction valley vacuum chambers; trolleys for the valley vacuum chambers, and central region platforms.

39879 (NAC-AR—84-01, pp 127-152) **Report of the Pretoria Cyclotron Group.** 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780939.

In Annual report June 1984.

The report summarizes the research activities of the Pretoria Cyclotron Group in six main categories: cyclotron operation and development; production of radioisotopes; neutron therapy facilities; radiation physics; radiobiology and services to industry and other organisations. The cyclotron is equipped for the bombardment of both internal and external targets for the production of radioisotopes; the machine is continually being upgraded and modernized and the extracted beam current has recently been increased to provide a suitable external deuteron beam for neutron therapy. The radioisotope production programme embraces research and development plus the routine production of radioisotopes, labelled compounds and radioactive sources for local medical and industrial use. Some long-lived radioisotopes are also produced for export in bulk. A fast-neutron therapy facility has almost been completed in collaboration with the Hillbrow and H F Verwoerd Hospitals of the Transvaal Provincial Administration (TPA). In support of the future neutron therapy programme, physical and radiobiological studies are being undertaken with fast neutrons. Services to industry and other organisations are rendered in the form of the regular supply of radioisotopes, preparation of special products and advice on the use of radioisotopes.

39880 (SAND—85-1451C) **Radlac II extraction experiments.** Mazarakis, M.G.; Leifeste, G.T.; Ekdahl, C.A.; Miller, R.B.; Freeman, J.R.; Poukey, J.W.; Wagner, J.; Armistead, D.J.; Bolton, D.L.; Coffman, T. (Sandia National Labs., Albuquerque, NM (USA); Science Applications International Corp., Albuquerque, NM (USA); Air Force Weapons Lab., Kirtland AFB, NM (USA)). 1985. Contract AC04-76DP00789. 7p. (CONF-8506141—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014709.

From SDIO/DARPA annual propagation review; Monterey, CA, USA (24 Jun 1985).

We have extracted the intense magnetized annular electron beams from the vacuum and the solenoidal magnetic field of the RADLAC II accelerator into a magnetic field-free, air-filled region. It was established experimentally that under proper matching condtitions the extracted beam propagates into and through the magnetic field region with no severe perturbation of its equilibrium. The accelerators used for these experiments were IBEX and RADLAC II. The observed beam parameters before and after extraction are in agreement with the theory and numerical calculations.

39881 (SLAC-PUB—3636) **Beam position monitor readout and control in the SLC linac.** Bogart, J.; Phinney, N.; Ross, M.; Yaffe, D. (Stanford Linear Accelerator Center, CA (USA)). Apr 1985. Contract AC03-76SF00515. 3p. (CONF-850504—193). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014291.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

A beam position monitoring system has been implemented in the first third of the SLC linac which provides a complete scan of the trajectory on a single beam pulse. The data is collected from the local micro-computers and viewed with an updating display at a console or passed on to application programs. The system must operate with interlaced beams so the scans are also interlaced, providing each user with the ability to select the beam, the update rate, and the attenuation level in the digitizing hardware. In addition each user calibrates the hardware for his beam. A description of the system architecture will be presented. 6 refs., 4 figs.

39882 **High current density plasma cathode.** Humphries S. Jr.; Savage, M.; Woodall, D.M. (Institute for Accelerator and Plasma Beam Technology, University of New Mexico, Albuquerque, New Mexico 87131). *Applied Physics Letters;* 47: No. 5, 468-470(1 Sep 1985).

A grid-controlled plasma cathode has been operated at high current density (15 A/cm^2) using vacuum insulator breakdown as the plasma source. The insulator spark generates a highly reproducible, 6-μs plasma pulse with density 10^{13} cm^{-3} at a distance of 6 cm. A number of sparks can be driven in parallel to supply large area plasma cathodes.

4304 Storage Rings

REFER ALSO TO CITATION(S) 39722, 40554

39883 **(IFVE-OUNK—83-121) Development and study of the UNK superconducting dipole models.** Andreyev, N.I.; Balbekov, V.I.; Bulatov, E.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1983. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701902.

Two full-scale dipole models, 6 m long each, have been manufactured in the scope of the program on development of superconducting dipoles for the UNK. Results of their tests in a bath cryostat are reported. A number of short models have been manufactured and tested with view to improve the integral characteristics of the magnetic field. The results of magnetic measurements of the central and edge field are presented. Also reported are the results of study of training and dynamic characteristics of dipoles.

39884 (JINR—D-1-83-541, pp 60-65) **Physical requirements to be met by characteristics of beams and experimental zones in the accelerator-storage complex.** Zajtsev, A.M.; Lapin, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1983. (In Russian). NTIS (US Sales Only), PC A07/MF A01. File Number DE85780971. (CONF-8312107—).

From Working conference on colliding beams experiments programme; Dubna, USSR (1 Dec 1983).

The main requirements are considered that are to be met by the characteristics of colliding pp beams with the energy E=0.4

TeV+3 TeV, the production of which is envisaged in the project of HEPI accelerator-storage complex (ASC). Diagrams for the arrangement of beam intersections of the 1-st and 2-nd stages in the ranges with a large and small β-function are presented. The layout of the ASC experimental zones is described. Ring parameters are: length l=20 km; number of protons in every storage ring Nsub(p) = 6 x 10^{14}; emittance epsilon sub(x) = epsilon sub(y) = 1 x 10sup(-5) cm at E=3 TeV and 5 x 10^{-5} at E=400 GeV; ultimate permissible values of β-functions in points of collision for 3 TeV βsub(max)=1000 m, β sub(min)=1m. The 3 TeV beam angular divergence ΔTHETA, in the range with a large β value is shown to be equal to (3 to 7) x 10^{-6} rad. For the 400 GeV beam the angular divergence requirement is somewhat lower, ΔTHETA = 5 x 10^{-5} rad.

39885 **(JINR—D-1-83-541, pp 29-40) MD-1 detector.** Baru, S.E.; Blinov, A.E.; Bondar', A.E. (AN SSSR, Novosibirsk. Inst. Yadernoj Fiziki). 1983. (In Russian). NTIS (US Sales Only), PC A07/MF A01. File Number DE85780971. (CONF-8312107—).

From Working conference on colliding beams experiments programme; Dubna, USSR (1 Dec 1983).

The MD-1 detector installed in the electron-positron VEPP-4 storage ring is described. The peculiarity of the detector is that its magnetic field is directed perpendicular to the beam orbit plane. The detector includes: a magnet, a vacuum chamber, proportional counters, shower-run chambers, muon chambers, scintillation counters, Cherenkov gas counters, a system for detecting scattered electrons, a system of measuring luminocity and a trigger placed in a CAMAC crate. The detector main characteristics are presented and background conditions are discussed.

44 INSTRUMENTATION

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 38961, 39735, 39773, 39774, 39775, 39776, 39885, 40213, 40214, 40215, 40225, 40251, 40254, 40665, 40912, 40913

39886 **(AD-A—152339/8/XAB) Use of a tissue-equivalent proportional counter for dose measurement and microdosimetric quantification of mixed radiation fields.** Cousins, T.; Rushton, L.P. (Defence Research Establishment, Ottawa, Ontario (Canada)). Jun 1984. 40p. (In French). (DREO—903). NTIS, PC A03/MF A01.

The response of a tissue-equivalent proportional counter to a variety of neutron, gamma-ray-and mixed radiation fields has been measured. The detection system encompasses unique electronic circuitry for data acquisition, followed by a dedicated microcomputer for analysis. The detector response to monoenergetic neutrons and gamma-rays served to quantify such radiation fields in terms of the microdosimetric parameters yF and yD, enabling comparison with the work of other experiments and existing computer codes. Excellent agreement was observed here. These experiments also resulted in a method of separating neutron and gamma-ray dose components in mixed radiation fields. Finally, the detector was used to measure both neutron and gamma-ray doses at two distances from the fast-neutron critical facility of the U.S. Army Pulse Radiation Division (Material Testing Directorate, Aberdeen Proving Ground, Md.). Both free-field doses and the dose delivered to the mid-abdominal position of a realistic anthropomorphic phantom were measured. Free-field results compare favorably with other work, while the absorbed dose to the gut was observed to vary significantly as a function of phantom orientation with respect to the core.

39887 **(AREAEE—256) Dosimetric energy response of $CaSO_4$; Dy thermoluminescence dosimeters to alpha particles.** Gomaa, M.A.; Eid, A.M. (Nuclear Research Centre, Inshas (Egypt)). 1981. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701658.

The main aim of the present experimental investigation is to study the dosimetric energy response of $CaSO_4$: Dy thermoluminescence dosimeter to alpha particles. For proper estimation of the dose absorbed by the dosimeter, the alpha particle fluence must be measured. In order to do so, CR-39 plastic track detector is used. Experimental results indicated that $CaSO_4$: Dy dosimetrie response to alpha particle is not only function to the alpha particle energy but also to the emission rate of the source.

39888 **(BNL—36633) Charged particle tracking in high multiplicity events at RHIC.** Foley, K.J.; Love, W.A. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 5p. (CONF-8504152—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014225.

From Workshop on experiments for RHIC; Upton, NY, USA (15 Apr 1985).

It is generally accepted that the ability to track some fraction of the charged particles produced in heavy ion collisions is very desirable. At a very minimum, one must detect the occurance of multiple interactions in a single crossing. The very tight beam structure at RHIC does not favor time separation, so the location of separate vertices seems the best solution. The limits of tracking large numbers of tracks in a solid angle approaching 4π have been explored. A model detector considered is a 2.5 m radius TPC, a true 3D tracking device. In order to estimate the particle density of a function of production angle, five Hijet Au-Au central events were used to deduce the particle density distribution as a function of polar angle. An important feature of a tracking detector is the effective "pixel" size - the area within which two tracks cannot be resolved. In a TPC with multistep avalanche chamber readout this is approximately 3 mm x 3 mm or ~0.1 cm^2. Using this pixel size we have calculated the radius at which the number of particles/pixel is 0.01 and 0.1. With the exception of the region very near the beam expect these distributions aren't expected to change very much with the application of a low (~ 0.5 tesla) magnetic field. While the actual reconstruction efficiency will depend on the fine details of the apparatus and reconstruction program, the 1% fill fraction is safe for efficiencies in the 80 to 90% region. Tracking is found to be feasible at pseudorapidities up to 3.

39889 **(CEA-CONF—7410) Ce^{+3}- and Tb^{+3}-luminescence in glasses. Ce^{+3}-activated bulk silica and silica thin films. An α-particle detector based on a Ce^{+3}-activated silica thin film. A Ce^{+3}-Tb^{+3}-energy transfer in a high melting point phosphate glass.** Heindl, R.; Loriers, J.; Sella, J.C.; Robert, A. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). Jul 1984. 2p. (CONF-8407124—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE85751991.

From 1. meeting of the luminescence group of the European section of the Electrochemical Society; Meudon-Bellevue, France (16 Jul 1984).

While many Ce^{+3}-activated glasses of different type emit strongly under UV (253,7 nm) and β-ray excitation, only the commercial silicate glass NE 905 shows a useful emission when exposed to α-particles. Only phosphate glasses have given the green Tb^{+3}-emission, when doped by it, under UV and α and β radiation. Sputtered films of Ce^{+3}-activated silica have appropriate luminescence properties, adherence to the substrate and a perfect chemical resistance to hot nitric acid. An α-particle detector has been built which has permitted the quantitative detection of plutonium in the presence of other radiative ions.

39890 **(CONF-850533—10) Si(Li)-NaI(Tl) sandwich detector array for measurements of trace radionuclides in soil samples.** Strauss, M.G.; Sherman, I.S.; Roche, C.T.; Pehl, R.H. (Argonne National Lab., IL (USA); Lawrence Berkeley Lab., CA (USA)). 1985. Contract W-31-109-ENG-38. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85013865.

From 6. symposium on X- and gamma-ray sources and applications; Ann Arbor, MI, USA (21 May 1985).

An ultra-sensitive x-/γ-ray detector system for assaying trace radioactivity in actinide contaminated soil and ash samples has been developed. The new system consists of an array of 6 large Si(Li) x-ray detectors sensitive on both faces and mounted on edge in a paddle-shaped cryostat with a 14 cm dia Be window on each side. The paddle, with a sample of the soil placed at each window, is sandwiched between 2 large NaI(Tl) scintillators which suppress the γ background. With x rays being measured simultaneously from soil in 2 sample holders and background reduced by 50% using anticoincidence, the sensitivity of this detector is 4 times higher than

that of conventionally mounted Si(Li) detectors. A soil sample containing 50 pCi/g ^{239}Pu was measured in 5 min with an uncertainty of <20% and a sample containing 7 pCi/g was measured in 1 hr. With FWHM resolution of 400 eV at 17 keV, the ULβ_1 and NpLβ_1 x-ray peaks are resolved thus permitting measurement of trace Pu in the presence of Am-241. This is the most sensitive and selective detector known for nondestructive assay of radioactivity in soil and other samples. 15 refs., 8 figs.

39891 (DOE/ER/40025—35) Analysis of Cherenkov counter efficiencies for E691. Cremaldi, L.; Elliott, J.; Gibney, M.; Nauenberg, U. (Colorado Univ., Boulder (USA)). 1985. Contract AC02-81ER40025. 21p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014900.

A program is outlined which simulates Cherenkov counters. The program can compute the effect of the magnetic field on the efficiencies of Cherenkov counters. It also tells what cone to mirror distance gives the highest collection efficiency and at which target position should the laser be placed to represent the direction of the actual Cherenkov light the mirror sees. (LEW)

39892 (EFI—611(1)-83) Spectrometric NaI(Tl) detector for cosmophysical investigations. Agaronyan, F.A.; Akhperdzhanyan, A.G.; Vartapetyan, G.A.; Galumyan, P.I.; Glyanenko, A.S.; Kotov, Yu.D.; Rubtsov, I.V.; Pogosyan, L.A.; Samojlenko, V.T.; Shirokov, M.Yu. (Erevanskij Fizicheskij Inst. (USSR)). 1983. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781299.

The problems of designing the spectrometric detector with the 1000 cm^2 area aimed for efperimets on studying the cosmic gamma radiation are discussed. The main parameters of the detector and the results of calibration measurements conducted by means of special spectrometric gamma sources are given. The detector radiator consists of six polished NaI(Tl) crystals with dimensions of 9 x 9 9 x 15 cm. The detector energy resolution for ^{137}Cs (Esub(γ) = 0.662 MeV) is equal to 16%.

39893 (EFI—616(6)-83) Trial operation of the MPK automatic system with the magnetic spectrometer at the Erevan synchrotron. Ajvazyan, R.B.; Bartikyan, M.V.; Kazaryan, A.P.; Kordonskij, M.S.; Matevosyan, Eh.M.; Nanasyan, A.S.; Sirunyan, A.M.; Torosyan, S.A.; Shikhlyarov, K.K. (Erevanskij Fizicheskij Inst. (USSR)). 1983. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781336.

The performance of the magnetic spectrometer with an automatic system of multiwire proportional chambers (mpk) with 1024 channels used for the measuring.

39894 (EFI—620(10)-83) Use of large NaI(Tl) i CsI(Tl) crystals for electron energy measurement in wide energy range. Danagulyan, S.S.; Ehlbakyan, G.M.; Adishchev, Yu.N.; Kurkov, A.A. (Erevanskij Fizicheskij Inst. (USSR)). 1983. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781300.

The results possibility of using NaI(Tl) crystals with the dimensions 130x130x300 mm^3 and CsI(Tl) of the diameter 100 mm and length 200 mm for the electron energy measurement in 50-1000 MeV energy range is discussed. The measurement results show that NaI(Tl) crystals of the given dimensions can be used for the electron energy measurement in 50-600 MeV energy range, and CsI(Tl) crystals in 50-800 MeV energy range, at some given voltage. 3 references, 6 figures.

39895 (IAE—3788/16) Table methods for event identification on the base of arithmetic criteria. Zhuk, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1983. 43p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781319.

The methods for event identification on the set of arithmetic criteria representing Boolean functions of predicates determined on the set of values of digital magnitudes are considered. Analytical evaluations of identification duration and required memory capacity for these methods are indicated. The approach to the choice of identification methods based on the selecting formal determination of the problem subglasses for each method that is to be more effective thin the others is given. It is shown that the suggested specialized methods are more effective for some subelasses of problems than those based on using decision tables. The methods considered are developed conformably to the problems of multidimensional spectra detection in nuclear physics. 17 references, 5 tables.

39896 (IAE—3804/2) Investigation of noise levels and useful effect in the neutrino experiment on the inverse beta-decay in the Rovno NPP laboratory. Afonin, A.I.; Bogatov, S.A.; Borovoj, A.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1983. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781327.

Experimental assessments of the useful effect and levels of different noise components are obtained in the neutrino laboratory at the Unit 2 of the Rovno NPP by means of a neutrino scintillation spectrometer. The laboratory and the neutrino spectrometer are described in brief as well as systems for noise suppression and selection of useful events. The facility noise includes three components: noise from random events, noise simulating a neutrino event and noise associated and not associated with the reactor. Two latter components are called correlated noise. It is shown that in the working regime related to the 1.5-10 MeV positron range, the effect from the reaction constitutes 300 events per day, the noise due to random coincidences-173, the correlation noise-120.

39897 (IAEA-TECDOC—321, pp 61-70) Effect of humidity on the response of HX dosimetry perspex to radiation. Chadwick, K.H. (Association Euratom-ITAL, Wageningen (Netherlands)). Dec 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781407. (CONF-8311247—).

From Final research co-ordination meeting on high-dose standardization and intercomparison for industrial radiation processing; Munich, F.R. Germany (8 Nov 1983).

Perspex can take up water to 2% of its weight and it takes only 48 hours at 80 deg. C for saturation of water uptake to occur. At room temperature the uptake is slower although 1% by weight can be accumulated within about 4 days. Humidity levels in perspex might affect the shape of the dose response curve as has been found for red perspex. The experiments reported here show that the change in dose response of clear perspex is hardly affected by a wide range of humidities although the driest perspex has the consistently lower response. After irradiation the oxygen diffusion controlled fading is dependent on humidity and proceeds most slowly in the driest perspex. Treatment of perspex in water at 80 deg. C for 48 hours prior to irradiation causes a large deviation in dose response above 15 kGy. This deviation can be ascribed to a much reduced induction of the instable optical density component previously ascribed to a free radical species. It is concluded that humidity changes should not cause any significant dosimetry error in the use of the clear perspex dosimeter in industrial radiation facilities.

39898 (IAEA-TECDOC—321, pp 71-89) Intercalibration and testing of blue cellophane- and cellulosetriacetate films for the megarad dose range. Gehringer, P.; Proksch, E. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H. Inst. fuer Chemie). Dec 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781407. (CONF-8311247—).

From Final research co-ordination meeting on high-dose standardization and intercomparison for industrial radiation processing; Munich, F.R. Germany (8 Nov 1983).

The γ-radiation response of blue cellophane films is dependent in a rather complex way upon dose rate as well as on the relative humidity of the air to which the films are under equilibrium. Generally, the response decreases with increasing humidity. Up to about 25% r.h. an increase in dose rate from 0.23 to 2.3 Gy/s results in a response increase of 10-15%. Above 66% r.h. there is no dose rate effect and at intermediate humidities a distinct negative dose rate effect was observed. Gamma irradiation of CTA films in air results in an absorbance change in the UV region which is higher than for electron irradiation and which is - contrary to the latter - dependent on the water content of the films. Replacing air by argon removes that humidity dependence and additionally, the γ-response in argon becomes almost identical to that found for elec-

tron irradiations. It may be concluded from this, that the dose rate - as well as the humidity effect are in fact oxygen effects. Post-irradiation coloration proceeds after irradiation under argon as well as under air. It is caused mainly by the reaction with some reactive intermediates of oxygen diffusing into the films after irradiation.

39900 (IAEA-TECDOC—321, pp 91-139) **Environmental effects on the ethanol-monochlorobenzene dosimeter system before, during and after irradiation.** Kovacs, A.; Stenger, V. (Magyar Tudomanyos Akademia, Budapest. Izotopintezete). Dec 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781407. (CONF-8311247—).

From Final research co-ordination meeting on high-dose standardization and intercomparison for industrial radiation processing; Munich, F.R. Germany (8 Nov 1983).

The dosimeters used for quality control in radiation processing have to fulfill a number of requirements, thus the role of different environmental effects was studied on the ethanol-monochlorobenzene dosimeter system before, during and after gamma irradiation. The effect of light, temperature, storage and transport conditions, and size of dosimeter ampoule was studied in detail. The corrected $G(Cl^-)$ value of the system was also checked and the applicability of the oscillometric evaluation method was extended. A number of international intercomparison results are also discussed.

39900 (IAEA-TECDOC—321, pp 141-157) **Progress in alanine/ESR transfer dosimetry.** Regulla, D.F.; Deffner, U.; Schindewolf, O.; Vogenauer, A.; Wieser, A. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.)). Dec 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781407. (CONF-8311247—).

From Final research co-ordination meeting on high-dose standardization and intercomparison for industrial radiation processing; Munich, F.R. Germany (8 Nov 1983).

Reference is given to a new and precise dosimetry method as developed, within a research contract, at the Gesellschaft fuer Strahlen- und Umweltforschung (GSF), Muenchen-Neuherberg with the International Atomic Energy Agency, Vienna. Concerning terminology, this method is named free-radical dosimetry or alanine/electron spin resonance (ESR) dosimetry. Apart from a review, fundamentals, physical, chemical and dosimetric parameters are given together with a system description. The report deals extensively with the effect of apparative parameters and influence quantities, and considers particularly 1) analysis of ESR equipment to reduce uncertainties, 2) quality improvement and assurance in sample preparation, 3) software development for data evaluation, 4) calibration of the system and 5) performance tests under laboratory and field conditions. For an objective rating of the overall uncertainty and reliability of the system achievable under routine conditions of transfer dosimetry, results of an international dose intercomparison are reported with the samples mailed, and irradiated at a primary standard dosimetry laboratory.

39901 (IAEA-TECDOC—321, pp 159-186) **Dosimetry for electron beam application.** Miller, A. (Risoe National Lab., Roskilde (Denmark)). Dec 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781407. (CONF-8311247—).

From Final research co-ordination meeting on high-dose standardization and intercomparison for industrial radiation processing; Munich, F.R. Germany (8 Nov 1983).

Two aspects of electron beam dosimetry are described, on one hand development of thin film dosimeters and measurements of their properties, and on the other hand development of calorimeters for calibration of routine dosimeters, e.g. thin films. Two types of radiochromic thin film dosimeters have been developed in this department, and the properties of these and commercially available dosimeters have been measured and found to be comparable. Calorimeters, which are in use for routine measurements, are being investigated with reference to their application as standardizing instruments, and new calorimeters are being developed.

39902 (IAEA-TECDOC—321, pp 187-207) **Development of ESR techniques for free radical dosimetry in electron beams.** Uribe, R.M. (Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Fisica). Dec 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781407. (CONF-8311247—).

From Final research co-ordination meeting on high-dose standardization and intercomparison for industrial radiation processing; Munich, F.R. Germany (8 Nov 1983).

This report describes the attempts to produce a free radical dosimeter based on the ESR measurement of paramagnetic centres induced by irradiation in some plastic materials which contain dye precursors as an additive. The report deals mainly with the study of the ESR signal of polyvinyl butyral with different dye precursors namely, pararosaniline cyanide, hexahydroxyethyl pararosaniline, formyl violet, new fuchsin, and malachite green, and of some other plastic materials with pararosaniline cyanide. It also describes the preparation of nylon films with and without dye for use in ESR measurements.

39903 (IAEA-TECDOC—321, pp 209-236) **Radiochromic dye dosimetry using triphenylmethane leucocyanides in nylon or polyvinyl butyral.** McLaughlin, W.L.; Humphreys, J.C. (National Bureau of Standards, Washington, DC (USA). Radiation Physics Div.). Dec 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781407. (CONF-8311247—).

From Final research co-ordination meeting on high-dose standardization and intercomparison for industrial radiation processing; Munich, F.R. Germany (8 Nov 1983).

The use of commercially-available radiochromic plastic films (nylon or polyvinylbutyral) containing the leucocyanide of hexa (hydroxyethyl) pararosaniline is well established in radiation processing dosimetry (dose range: 10^1-10^5 Gy), especially for ^{60}Co gamma-ray applications. These thin-film systems when analyzed by spectrophotometry provide a convenient and routine means of dose assessment and dose-distribution mapping, as long as they are properly calibrated in standard gamma-ray fields and as long as suitable corrections are made for systematic error. In the present work, the following contributions to uncertainty in making absorbed dose evaluations with radiochromic film dosimeters were studied: variations in absorbed dose rate, photon energy, temperature, relative humidity, immersion in vacuum or gases other than air (oxygen, nitrogen, nitrous oxide) during irradiation and during storage. These influences on radiochromic dosimeter response and stability have been studied in detail experimentally, and suggestions are made for minimizing the resulting uncertainties in practice.

39904 (IFVE-OEF—84-39) **Method of detection of transition radiation by wire chambers operating in self-quenching streamer mode.** Akopdzhanov, G.A.; Bityukov, S.I.; Dzhelyadin, R.I.; Zaitsev, A.M.; Lapin, V.V.; Saraikin, A.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781338.

A method for detecting X-ray transition radiation against the background of the signal from relativistic charged particles is suggested that is based on the use of peculiarities of the development of self-quenching streamer mode. The self-quenching streamer discharge in the Xe^+ isobutane mixture is experimentally registered. The effect of separation of signals from the relativistic particle and from soft X-ray, is obtained.

39905 (IFVE-OEF—84-66) **Film converters for ultraviolet radiation.** Gavrishchuk, O.P.; Semenov, V.K. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781301.

To extend the sensitivity region of the photomultipliers (PM) with glass entry windows, one- and multi-component film converters (FC) of ultra violet radiation in the range of 185-310 nanometer wave lengths have been investigated. The FC have been obtained on the PM entry window following drying of the applied solution

of the filmproducing substance and spectrum shifter (p-terphenyl, PPO, POPOP in toluene. The technique for determining the FC efficiency with a spectrophotometer is described. The utilization, in the Cherenkov gas counter with an air radiator, of the optimized composition FC on the glass PM permits to increase 23 times the number of observed photoelectrons, which may be compared with the effect of using a quartz window PM. The PM are easily manufactured, possess high mechanical strength and do not change their physical and mechanical properties with time. 11 references, 9 figures, 1 table.

39906 **(IFVE-OEF—84-82) Prospect for using charge-coupled devices in precise vertex detectors for short-lived particle decays.** Golovkin, S.V.; Rykalin, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781339.

Versions of the vertex detector (VD) with charge coupling devices (CCD) are considered. VD basic characteristics are given. The experimental data on CCD show that VD With CCD is a promising device for experiments on short-lived particles with $r <$ or approximately 10^{-14} s. CCD capability to measure two coordinates in one plane with an accuracy of 1 μm is its distinguished feature. VD may work under the loadings of about approximately 10^{7} s.

39907 **(IFVE-OEF—84-83) Study on the short-term instability and ways to stabilize amplification of photomultipliers.** Evdokimov, V.N.; Mutafyan, M.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781340.

The results on studying short-term instability of PM 84-3, PM-49B, PM-110 photomultipliers (PM) Under high pulsed rate conditions are given. The PM amplification factor dependence on the average value of the anode current is studied. A simple way to stabilize PM amplification under high pulsed rate has been proposed. Dinode signal measurement showed that the dinode system is the main source of amplification instabilities.

39908 **(IFVE-OEF—84-105) Software for the HYPERON facility track detector monitoring.** Belousov, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781337.

The program complex for data processing from wire spark chambers and proportional chambers applied at the HYPERON facility is briefly described. The complex comprises a series of codes which enable one to determine the detectors working capacity, estimate particles detecting efficiency, noise characteristics, establish the zone of passage of the basic part of the beam, its dimensions and location in the detectors region, determine track detecting efficiency, display detectors disposition, point out the number and location of sparks, display geometric apparatus configuration. The system operation has shown the efficiency of the applied procedures in the adjustment process of the facility subsystems. The total volume of software constitutes 30 thousand commands.

39909 **(IFVE-OEIPK—84-118) Procedure for physicist's scanning in the image processing system of bubble chambers.** Gritsaenko, I.A.; Petrovykh, L.P.; Petrovykh, Yu.L.; Fenyuk, A.B. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781341.

Submitted to the journal Instrum. Exp. Tech. .

The algorithm of the program of physicist's scanning for data processing from photo images in experiments using bubble chambers is described. The program allows one to perform sorting or selection of specific events for subsequent processing and identification of separate particles by bubble density along the track or by the character of the decay. The fraction of protons separated automatically constituted 97%. The program has been used for processing 50 thousand events at the BEBC chamber.

39910 **(IFVE-ONF—84-124) Time resolution of the liquid argon detectors. Part 2. Physically realizable filters.** Krasnokutskij, R.N.; Fedyakin, N.N.; Shuvalov, R.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 21p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781302.

Different versions of (RC)-(CR) filters are considered. Application of simple circuits was shown to give the time resolution close to theoretical limit. High purity argon was found not to have any - advantage as compared with commercially available dirty one (approximately 10^{-6} on oxigen scale) at short (200-500 ns) processing time of the signal. Increasing processing time for pure argon allows to obtain time resolution up to approximately 8 ns for a minimally ionizating particle and detector capacity about 100 pF. 8 references, 6 figures, 8 tables.

39911 (INIS-BR—260, pp 426-437) **Shielding considerations and design of a set up for on-line determination of aluminium in bauxite ore using activation analysis with Am-Be neutron source.** Narain, R. (Pernambuco Univ., Recife (Brazil). Dept. de Energia Nuclear). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

A system for on-line determination of aluminium in bauxite ore using activation analysis method with 5 Ci Am^{241}-Be neutron source has been developed at UFPE. Shielding considerations were established for internal and external radiation in this set up. In view of the complicated geometry of the set up, simple methods have been employed in the design and analysis, with a view to improve signal to noise ratio for aluminium detection. Required thicknesses of shielding material, separation between various components, streaming effect etc. have been established for the set up.

39912 **(INIS-mf—9304) Detector systems for the integral intensity measurement of nuclear radiation with high accuracy and time resolution.** Romanski, H.J. (Bochum Univ. (Germany, F.R.). Abt. fuer Elektrotechnik). 8 Jul 1983. 159p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE85781350.

This thesis deals with detector systems which are suited for the determination of the integral intensity of nuclear radiation. The accuracy and the time resolution represent thereby the main aspects. By means of the physical foundations the dependence on accuracy and time resolution is demonstrated, and from this the requirements on new detector systems are derived. In the selection of the detector type it become evident the ionization chambers and scintillation detectors hitherto mainly used as radiation detectors also represent the base for new detector systems. Thereby no detector type can be replaced by the other because of their different properties. For ionization chambers therefore a new construction principle is derived by means of the physical foundations by which the amplitude and time resolution can be influenced mutually independently in a broad range. For the scintillation detectors by application of the integral current measurement both the amplitude and the time resolution could be improved. For the improvement of the time resolution which is affected by the afterglow of some scintillator materials (for instance NaI(Tl)) the time function of this contribution to the light intensity is mathematically described, and from this a compensation circuit for the improvement of the time resolution is derived.

39913 (INIS-mf—9481, pp 172-176) **Problems of detectable activities and rational measurement time.** Vondra, M. (Vyskumny Ustav Vodneho Hospodarstva, Bratislava (Czechoslovakia)). 1982. (In Slovak). NTIS (US Sales Only), PC A10/MF A01. File Number DE85780894. (CONF-8209269—).

From Radionuclides and ionizing radiation in water management conference; Liberec, Czechoslovakia (8 Sep 1982).

Processing experimental results and their interpretation are discussed with regard to low level activity counting. The concepts of lower limit of detection (LLD) and lowest detectable activity

(LDA) are discussed and relations presented for their calculation. Using the Gaussian approximation of Poisson distribution it was possible to derive the relation (t/sub B+S/t/sub B/)c/sub B/ >= 50 where t/sub B+S/ is the time of measuring the sample and the background, c/sub B/ is the number of background pulses. The relation was used for determining LLD and LDA of a beta detector with plastic scintillator. It was found that for the said measuring system and a measurement time of 50 mins it is possible to determine with 90% accuracy the presence of 38,5 mBq activity in environmental samples. Extended measurement time results in a decrease in LDA.

39914 (INIS-mf—9482, pp 2) **Thermoluminescence tubes for personnel dosimetry.** Adametz, O. (Monokrystaly, Turnov (Czechoslovakia)); Ott, O. (Vyzkumny Ustav Klinicke a Experimentalni Onkologie, Brno (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

39915 (INIS-mf—9482, pp 8) **Methodology of measuring high density of tracks in UVVVR neutron dosemeters.** Bohacek, I.; Trousil, J.; Prusa, J.; Sandera, M. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)); Kreisinger, F. (Jaderna Elektrarna Dukovany (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

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39916 (INIS-mf—9482, pp 10) **Neutron dosimetry application of moderation effect of ligands in cobalt(III) complexes.** Brozek, V.; Benda, F. (Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia)); Moltas, K.; Seda, J. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia). Fakulta Jaderna a Fysikalne Inzenyrska). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

39917 (INIS-mf—9482, pp 13) **Interpretation of personnel dosimetry results in new units.** Bucina, I.; Snobr, J. (Institut Hygieny a Epidemiologie, Prague (Czechoslovakia)); Prouza, Z. (Karlova Univ., Prague (Czechoslovakia). Biofyzikalni Ustav); Trousil, J. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

39918 (INIS-mf—9482, pp 31) **Dose ratemeter NB 9201.** Gregor, J.; Knapp, K.; Severa, L. (Tesla, Premysleni (Czechoslovakia). Vyzkumny Ustav Pristroju Jaderne Techniky). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

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39919 (INIS-mf—9482, pp 36) **Dosimetric properties of Czechoslovak-made neutron-gamma dose ratemeter NDK 601.** Hermanska, J.; Prouza, Z.; Smutna, J. (Karlova Univ., Prague (Czechoslovakia). Biofyzikalni Ustav); Severa, L.; Tomankova, A. (Tesla, Premysleni (Czechoslovakia). Vyzkumny Ustav Pristroju Jaderne Techniky); Kodl, O.; Zachariasova, I.; Velartova, A. (Institut Hygieny a Epidemiologie, Prague (Czechoslovakia). Ustav Hygieny Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

39920 (INIS-mf—9482, pp 48) **Simple water calorimeter for measuring absorbed dose in irradiation using Tesla-4 MeV linear electron accelerator.** Janovsky, I. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

39921 (INIS-mf—9482, pp 67) **New method of calculating parameters of electron capture levels of thermoluminescence materials using double-temperature annealing.** Kubu, M. (Vyskumny Ustav Preventivneho Lekarstva, Bratislava (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

39922 (INIS-mf—9482, pp 82) **Use of albedo dosemeters in radiation protection.** Nikodemova, D.; Kubu, M.; Hrabovcova, A. (Vyskumny Ustav Preventivneho Lekarstva, Bratislava (Czechoslovakia)). Aug 1983. (In Slovak). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

39923 (INIS-mf—9482, pp 98) **New neutron dosemeter by UVVVR and its dosimetric characteristics with regard to its application in the nation-wide personnel dosimetry service.** Prusa, J.; Trousil, J.; Bohacek, I.; Kokta, L. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)); Prouza, Z. (Karlova Univ., Prague (Czechoslovakia). Biofyzikalni Ustav); Jakes, J. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia). Fakulta Jaderna a Fysikalne Inzenyrska). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

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39924 (INIS-mf—9482, pp 104) **Ionization chambers for measurement in high-energy electron and photon beams.** Severa, L.; Gregor, J. (Tesla, Premysleni (Czechoslovakia). Vyzkumny Ustav Pristroju Jaderne Techniky). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

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39925 (INIS-mf—9482, pp 109) **Radiation dosimetry on board Salyut-7 station during the sixth basic expedition.** Spurny, F.; Barta, K.; Charvat, J.; Simunkova, N. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
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39926 (INIS-mf—9482, pp 112) **Neutron dosimetry using ionization measurement methods.** Spurny, F.; Votockova, I. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
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39927 (INIS-mf—9482, pp 118) **Use of luminescence diodes as integral dosemeters.** Sandera, M.; Prasil, Z. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)); Galikova, A. (Tesla, Prague (Czechoslovakia). Vyzkumny Ustav pro Sdelovaci Techniku). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39928 (INIS-mf—9482, pp 128) **Extending the measuring capacity of TL phosphate glass to the kGy dose range.** Trousil, J.; Sandera, M.; Kotek, J.; Spackova, M. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
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39929 (INIS-mf—9482, pp 131) **Electret ionization chamber, a detector of mixed neutron/gamma radiation dose.** Vit, V. (Monokrystaly, Turnov (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
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39930 (INIS-mf—9482, pp 132) **Use of activation detectors for low neutron flux densities.** Vychytil, F. (Skoda, Plzen (Czechoslovakia). Zavod Energeticke Strojirenstvi). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
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39931 (INIS-mf—9482, pp 6) **Assessment of secondary gamma radiation caused by neutron interactions in iron.** Benes, M.; Cvachovec, F.; Komarek, M. (Vojenska Akademie A. Zapotockeho, Brno (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
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39932 (INIS-mf—9482, pp 19) **Unfolding of beta spectra measured with semiconductor detector.** Dryak, P. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39933 (INIS-mf—9482, pp 43) **Activity determination of natural radionuclides in large-volume samples by semiconductor gamma spectrometry.** Hulka, J.; Malatova, I.; Bucina, I.; Rulik, P.; Michalek, V. (Institut Hygieny a Epidemiologie, Prague (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
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39934 (INIS-mf—9482, pp 45) **LET spectrometry using solid-state track detectors.** Charvat, J. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
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39935 (INIS-mf—9482, pp 49) **Neutron spectra following passage through iron.** Jansky, B. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
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39936 (INIS-mf—9482, pp 54) **Theoretical calibration of aerial spectrometer for accident dosimetry of nuclear power plant vicinity.** Kluson, J.; Cechak, T. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia). Fakulta Jaderna a Fysikalne Inzenyrska); Stredova, A. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
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39937 (INIS-mf—9482, pp 125) **Development of programs for calculating neutron spectra from integral detector data.** Tichy, M.; Kralik, M. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39938 (INIS-mf—9482, pp 111) **Solid-state track detector response to high-energy charged particles.** Spurny, F.; Simunkova, N.; Turek, K. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39939 (INIS-mf—9482, pp 113) **Thermoluminescent detector response to high-energy charged particles.** Spurny, F.; Votockova, I. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39940 (INIS-mf—9482, pp 26) **Use of ^{3}He proportional chamber in low neutron flux measurement; results for selected localities.** Florek, M. (Komenskeho Univ., Bratislava (Czechoslovakia)); Nikodemova, D. (Vyskumny Ustav Preventivneho Lekarstva, Bratislava (Czechoslovakia)); Sujak, P. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice (Czechoslovakia)). Aug 1983. (In Slovak). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39941 (INIS-mf—9482, pp 33) **Relation of chemical etching and performance of Si/Au detectors.** Hanzlik, J.; Tykva, R. (Ceskoslovenska Akademie Ved, Prague. Ustav Organicke Chemie a Biochemie). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39942 (INIS-mf—9482, pp 37) **Efficacy of TSEE response for soft beta detection.** Hobzova, L. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39943 (INIS-mf—9482, pp 41) **Preparation of $CaSO_4$-Dy and one of the possibilities of manufacturing TL gamma detectors.** Hruska, J. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39944 (INIS-mf—9482, pp 44) **Efficiency calibration of HPGe and Ge(Li) detectors for large-volume samples.** Hulka, J.; Rulik, P.; Malatova, I.; Bucina, I. (Institut Hygieny a Epidemiologie, Prague (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39945 (INIS-mf—9482, pp 47) **Recombination in ionization chambers in ^{60}Co gamma beam.** Janotova, I.; Novotny, J.; Jirousek, P.; Kovar, I.; Vavra, S. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
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39946 (INIS-mf—9482, pp 51) **Determination of nSi/Au detector charge pulse from measured values.** Jisl, R. (Vyzkumny Ustav Strojirenske Technologie a Ekonomiky, Prague (Czechoslovakia)); Tykva, R.; Fiala, J. (Ceskoslovenska Akademie Ved, Prague. Ustav Organicke Chemie a Biochemie). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39947 (INIS-mf—9482, pp 52) **Experience with Czechoslovak solid-state plastic track detectors type CR-39.** Just, L.; Kudela, K. (Slovenska Akademia Vied, Kosice (Czechoslovakia). Ustav Experimentalnej Fyziky); Houska, M.; Obereigner, B.; Vacik, J. (Ceskoslovenska Akademie Ved, Prague. Ustav Makromolekularni Chemie). Aug 1983. (In Slovak). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39948 (INIS-mf—9482, pp 60) **Practical aspects of use of Ge-based detectors in analysis of large-volume samples.** Kovar, P.; Dryak, P.; Kokta, L. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39949 (INIS-mf—9482, pp 89) **Possible uses of liquid scintillation detector in radionuclide metrology.** Plch, J.; Heppnerova, M.; Dutka, Z. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39950 (INIS-mf—9482, pp 91) **Affecting the conditions of detecting with measuring cuvette the Cherenkov radiation due to ^{32}P.** Podracka, E. (Institut pro Klinickou a Experimentalni Medicinu, Prague (Czechoslovakia)); Tykva, R. (Ceskoslovenska Akademie Ved, Prague. Ustav Organicke Chemie a Biochemie). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39951 (INIS-mf—9482, pp 99) **Instability of liquid scintillation measurement due to labelled compound sorption.** Rexa, R. (Univerzita P.J. Safarika, Kosice (Czechoslovakia). Katedra Vseobecnej Biologie); Tykva, R. (Ceskoslovenska Akademie Ved, Prague. Ustav Organicke Chemie a Biochemie). Aug 1983. (In Slovak). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39952 (INIS-mf—9482, pp 108) **Response of thermoluminescent detectors to fast neutrons.** Spurny, F.; Barta, K.; Cerhova, L.; Votockova, I. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39953 (INIS-mf—9482, pp 129) **Effect of particle fluence on track diameter and response of electrochemically etched solid-state track detectors.** Turek, K. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni); Dajko, G. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39954 (INIS-mf—9482, pp 130) **Scintillation detector for ^{226}Ra measurement in waters.** Vasek, T.; Dvorak, V.; Bendl, J.; Havlas, J.; Novakova, O.; Svobodova, B. (Tesla, Premysleni (Czechoslovakia). Vyzkumny Ustav Pristroju Jaderne Techniky); Sedlacek, J.; Sebesta, F. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia). Fakulta Jaderna a Fysikalne Inzenyrska). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

39955 (INIS-mf—9532, pp 129-132) **Reassessment of radiation doses measured by TLD.** Ben-Shachar, B.; German, U.; Weiser, G. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev). 1983. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780892. (CONF-831241—Summ.).

From Joint US/Israeli meeting on safety and siting problems for power reactors in a small country; Haifa, Israel (20 Dec 1983).
Published in summary form only.

39956 (INIS-mf—9532, pp 289-292) **Evaluation of fast neutron spectra (0.5-14.0 MeV) by means of a passive miniature proton spectrometer based on polyethylene radiators and a CR-39 track detector.** Faermann, S.; Eisen, Y.; Ovadia, E.; Schlesinger, T. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center); Werner, A. (Sheba Medical Center, Tel Hashomer (Israel)); Kushilevski, A.; Tshehanski, A. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Nuclear Engineering). 1983. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780892. (CONF-831241—Summ.).

From Joint US/Israeli meeting on safety and siting problems for power reactors in a small country; Haifa, Israel (20 Dec 1983).
Published in summary form only.

39957 **(INIS-mf—9566) Distorted field cylindrical mirror electron spectrometer. Part 1. Calculation of the analyzer.** Varga, D.; Koever, A.; Koever, L.; Redler, L. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). 1984. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781491.

A novel double focusing distorted electrostatic cylindrical mirror analyzer is presented which has some advantages compared to the classical one, e.g. its dispersion is superior. The effect of the fringing field was taken into consideration in the design, resulting in some improvements of the features of the analyzer. (author).

39958 (INIS-mf—9573-Vol.2, pp 197-226) **Instruments used in radiation protection.** Iturbe Hermann, F. (Instituto Nacional de Investigaciones Nucleares, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781409.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Described are some instruments used in external radiation monitoring as well as in monitoring external and internal contamination.

39959 (INIS-mf—9573-Vol.3, pp 320-333) **Counting by liquid scintillation techniques.** L'Annunziata, M.F. (International Atomic Energy Agency, Vienna (Austria)). 1981. (In Spanish). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781444.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Liquid scintillation counting is outlined and its use as a technique in quantifying radioactive tracer activity described.

39960 (INIS-mf—9573-Vol.3, pp 334-340) **Cerenkov counting.** L'Annunziata, M.F. (International Atomic Energy Agency, Vienna (Austria)). 1981. (In Spanish). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781444.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Cerenkov radiation using a liquid scintillation counter for analyzing radioactive tracers is described.

39961 (INIS-mf—9573-Vol.3, pp 343-346) **Double labelled sample counting.** L'Annunziata, M.F. (International Atomic Energy Agency, Vienna (Austria)). 1981. (In Spanish). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781444.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Principles and techniques for radioanalysis of samples of double labelled beta emitters are discussed.

39962 (INIS-mf—9625, pp 16) **Laboratory scintillation gamma spectrometer.** Bartosek, J.; Masek, J. (Geofyzika, n.p., Brno (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).
Published in summary form only.

39963 (INIS-mf—9625, pp 19) **Detection limits obtained using different search procedures.** Dryak, P.; Kovar, P. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).
Published in summary form only.

39964 (INIS-mf—9625, pp 22) **Use of low-background shielding covers in radionuclide analysis.** Stanicek, J. (Komenskeho Univ., Bratislava (Czechoslovakia). Matematicko-Fyzikalna Fakulta). Oct 1984. (In Slovak). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).
Published in summary form only.

39965 (INIS-mf—9625, pp 23) **Shielding for low-level spectrometry.** Bucina, I.; Hulka, J.; Kolinsky, P.; Malatova, I.; Rulik, P. (Institut Hygieny a Epidemiologie, Prague (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).
Published in summary form only.

39966 (INIS-mf—9625, pp 18) **Peak efficiency of coaxial Ge(Li) detector for large-volume samples.** Beseova, G.; Chudy, M.; Pokorny, V. (Komenskeho Univ., Bratislava (Czechoslovakia). Matematicko-Fyzikalna Fakulta). Oct 1984. (In Slovak). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).
Published in summary form only.

39967 (INIS-mf—9626-Vol.1, pp 209-218) **Automated/computerized TLD-monitoring system in Boris Kidric Institut - Vinca.** Prokic, M.; Popovic, N.; Hadzic, D. (Institut za Nuklearne Nauke Boris Kidric, Belgrade (Yugoslavia)). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85781216. (CONF-830995—Vol.1).

From 11. regional congress of the International Radiation Protection Association: recent developments and trends in radiation protection; Vienna, Austria (20 Sep 1983).

The paper describes system of microcomputer controlled thermoluminescence personnel dosimetry monitoring in Institute of nuclear sciences, Vinca. Results showed that automated and computerized TLD system resulted in higher degree of accuracy and have an advantage in comparison with the classical manner of data processing. The peculiarity of the described automated monitoring system is the fact that the dosimetric control is performed with the new type of near tissue-equivalent, high sensitive, own produced TL dosimeters. The four year experience showed highly satisfying results.

39968 (INIS-mf—9626-Vol.2, pp 3-7) **Improved model of electron interaction with matter to be used for calculation of detector's response function.** Smelcerovic, M.; Markovic, P. (Institut za Nuklearne Nauke Boris Kidric, Belgrade (Yugoslavia)). 1984. NTIS (US Sales Only), PC A13/MF A01. File Number DE85781217. (CONF-830995—Vol.2).

From 11. regional congress of the International Radiation Protection Association: recent developments and trends in radiation protection; Vienna, Austria (20 Sep 1983).

Classical models of electron interaction with matter which are being applied in Monte Carlo calculations, have a limitted application in spectrometric calculations. These classical models give correct results for the average values of different integral interaction characteristics, such as in the exposure dose, but they lead to the large error for detector's response function calculation. In this paper is presented an improved model which takes into account bremsstrahlung, corrected energy loss distribution along the elementary path as well as algoritam of the calculation.

39969 (INIS-SU—282, pp 498) **Magnetic spectrometers with position-sensitive detectors in the source plane.** Babenkov, M.I.; Bobykin, B.V.; Zhdanov, V.S.; Starodubov, S.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39970 (INIS-SU—282, pp 499) **Sector beta-spectrometer with a position-sensitive detector.** Babenkov, M.I.; Balashov, V.I.; Bobykin, B.V.; Zhdanov, V.S.; Starodubov, S.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39971 (INIS-SU—282, pp 500) **Beta spectrometer for precise comparative measurements with two beta sources.** Babenkov, M.I.; Bobykin, B.V.; Zhdanov, V.S.; Starodubov, S.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39972 (INIS-SU—282, pp 501) **Multidimensional parametric Moessbauer spectrometer.** Gall', R.N.; Irkaev, S.M.; Semenkin, V.A.; Sokolov, M.M. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39973 (INIS-SU—282, pp 504) **Energy calibration of a crystal diffraction gamma spectrometer.** Alekseev, V.L.; Kabina, L.P.; Rumyantsev, V.L. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39974 (INIS-SU—282, pp 507) **Installation for investigation of radioactive nuclei properties by laser radiation.** Gangrskij, V.P.; Markov, B.N.; Marinova, K.P.; Nadzhakov, E.G.; Oganesyan, Yu.Ts.; Chan Kong Tam. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39975 (INIS-SU—282, pp 508) **Installation with laser interferometer for nuclear gamma resonance spectroscopy.** Puchkov, I.V.; Fedorin, V.L. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39976 (INIS-SU—282, pp 517) **Microprocessor stabilizer of magnetic field on the base of NMR nutation probe.** Zhernovoj, A.I.; Abramkin, S.V.; Inozemtsev, A.N. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39977 (INIS-SU—282, pp 518) **2γ and 3γ annihilation decay spectrometer.** Ehtin, G.I.; Supruzhnikov, A.N. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39978 (INIS-SU—282, pp 541) **Using results of XL-radiation spectra unfolding during ^{238}Pu and ^{239}Pu decay for efficiency calibration of X-ray spectrometers.** Bak, L.M.; Oryyak, P.; Nedovesov, V.G.; Sidorenko, S.A.; Shchukin, G.E.; Yakovlev, K.P. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39979 (INIS-SU—282, pp 588) **Energy resolution of a single crystal scintillation spectrometer with several photomultipliers.** Samedov, V.V.; Stolyarova, E.L. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39980 (INIS-SU—282, pp 591) **Using atom recoil method in the development of detectors with thin insensitive layers.** Barabash, L.I.; Kibkalo, T.I.; Litovchenko, P.G.; Lobkovskij, A.P. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39981 (INIS-SU—282, pp 593) **In-beam gamma spectroscopy at the U-240 cyclotron.** Vishnevskij, I.N.; Dej, Yu.A.; Mel'nikov, O.B.; Patlan', Yu.V.; Tkachuk, I.P.; Trishin, V.V. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

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From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39982 (INIS-SU—282, pp 523) **Positron-sensitive proportional chamber with a high-resistance cathode.** Vakhtel', V.M.; Golovkov, N.A.; Tokmakov, A.V.; Chumin, V.G. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39983 (INIS-SU—282, pp 605) **Spectrometer for positron lifetime measurement. Lifetimes of positrons in LiF and BaF.** Vinarov, N.G.; Georgieva, M.K.; Tumbev, G.Kh. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

39984 (ITEF—174(1983)) **Calibration of an electron shower detector using a neutral beam.** Berezin, V.M.; Bogdanov, E.T.; Vishnevskij, M.E. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1983. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781342.

In a number of experiments, where the products of the investigated rare decays of k^0l mesons include γ-quanta or electrons, in order to decrease the number of background triggering of the installation one should switch on the electron detector signal into the trigger pulse condition, with the detector calib ated prior to measurements. The technique and results of calibration of the magnetic spectrometer electron shower detector are described. The calibration with a neutral beam has been performed in two stages with electrons produced by γ quanta in a lead connverier. For determining the electron momentum scintillation counters and spark chambers have been applied. Using light diodes permitted to introduce corrections for the arift of the amplification factor of the equipment.

39985 (JAERI-M—84-010, pp 400-406) **Report on the recent activities of neutron experiments at KURRI-Linac.** Fujita, Yoshiaki; Hayashi, S.A. (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). Mar 1984. (In Japanese). JAERI-Tokai-Mura, Naka-gun, Ibaraki-ken, 319-11, Japan. File Number TI84901547. (CONF-8311187—; NEANDC(J)—97/AU; INDC(JPN)—84/G).

From JAERI seminar on nuclear data; Tokai, Japan (30 Nov 1983).

A report is given on the recent activities in neutron experiments at KURRI-Linac by selecting a few topics (i) A pending problem for the energy spectrum in a chromium pile, (ii) Preparation of a BGO scintillator for capture cross section measurements, (iii) Total cross section measurement of Si at the windows.

39986 (JINR—10-84-204) **Experimental data registration system of DEMAS-MULTI setup.** Kamanin, V.V.; Kugler, A.; Kuznetsov, A.N.; Ryudiger, Yu.; Subbotin, V.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781330.

The block diagram and description of the system, organization of measurements, signal time diagram in a CAMAC crate, a short list of the software, for the DEMAS-MULTI multipurpuse installation are presented. The device is intended for determination of gamma-multiplicity in coincidence with light charged particles. Registration rate in experiments achieves 700 events/second. The system has a number of peculiarities: 1. All electronics including KAMAK crate is in direct vicinity to the detecting part which reduces the possibility of setting in spectrometric tracts. 2. Information transfer at large distances is performed only in the numeric form by a single cable made of twisted couples of wires, which provides good interference protection. 3. A convenient and flexible program of data set can be used in a wide range of different correlation measurements 4. Mainly standard and JINR made units easily replaceable when necessary are used in the system.

39987 (JINR—10-84-450) **Program of geometric reconstruction for the Lyudmila facility with internal track-sensitive target.** Artenyan, A.S.; Badalyan, S.G.; Batyunya, B.V.; Bruntsko, D.; Vrba, V.; Dirner, A.; Gramenitskij, I.M.; Ivanov, V.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781289.

A program of geometric reconstruction for the Ludmila facility with an internal track-sensitive target is described. The main features of the program connected with the existence of several optical media in track-sensitive volume of the facility are presented. The program is adapted on the CDC-6500 computer. Calculation time for one even varies from 20 to 40 s.

39988 (JINR—13-84-34) **Spectrometer for investigation of perturbed gamma-gamma angular correlations with three Ge(Li) detectors and two analog-to-digital converters on-line with SM-3 computers.** Petrzhik, M.; Fominykh, V.I.; Fominykh, M.I.; Prokhazka, I.; Finger, M.; Tsupko-Sitnikov, V.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781332.

An analog and control devices of gamma-gamma perturbed angular correlation spectrometer operating on-line with the sm-3 computer in 3d analizing regime are described. Coincidence data registration is fully carried out and recorded on magnetic tapes. Three integral coincidenced spectra are formed after the data storing to be outputed to a digital display. Application of only two analog-to-digital converters when operating the three detectors is the specific feature of the spectrometer. Further increasing of detector number not causes the ad dc number increasing. The control system of the spectrometer is made in camac standard. The spectrometer is intended to study the perturbed angular gamma-gamma correlations, starting with helium temperatures and is a part of the spin instrumentation complex of the JINR Laboratory of Nuclear Problems.

39989 (JINR—13-84-54) **Technique and results of spectroscopy amplifiers testing for semiconductor nuclear radiation detectors.** Petrzhik, M.; Fominykh, V.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781333.

The technique and instrumentation for measuring of general parameters of preamplifiers, linear and fast amplifiers, shapers of time keeping intended for pulse height and time measurements when using semiconductor nuclear radiation detectors are described. Noise properties, temperature instability, integral nonlinearity, loading capacity are selected as general parameters for preamplifiers and linear amplifiers as well as the value of spread of time keeping signal for fast amplifiers and shapers is selected two. The results of comparative testing of JINR, canberra and rolon units are presented. Standardized measuring devices of common application are used as measurement instrumentation. Possibility of properties estimation of selective amplifiers by using the general parameters but not radioactive isotopes, detectors, multichannel analysers is shown. The results of measurements are reproducible easily.

39990 (JINR—13-84-161) **Gas threshold Cherenkov 14-channel counter.** Vojchishin, M.N.; Devitsin, E.G.; Zavertyaev, M.V.; Kozlov, V.A.; Pavlovskaya, V.V.; Gus'kov, B.N.; Zinchenko, A.I.; Kapishin, M.N.; Cholakov, V.D.; Chudakov, E.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781290.

A gas threshold Cherenkov 14-channel counter filled with freon-12 at 1 atm pressure is described. The counter is used in BIS-2 spectrometer at the Serpukhov accelerator. Radiator length is 15O cm. Optical part contains 14 spherical mirrors of 200 cm curvature radius, light collectors and photomultipliers of XP-2041/Q type shielded from scattered magnetic fields by the magnetic screens. Counter efficiency is greater than 98% for particles with β

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$>=$ 0.995. The counter has been included into BIS-2 identification system for charged hadrons. 8 references, 3 figures, 1 table.

39991 **(JINR—13-84-213) Time performance investigation of the spectrometer with a planar HPGe detector.** Morozov, V.A.; Stegajlov, V.I.; Kachalkin, A.K.; Lizurej, G.; Osipenko, B.P.; Prazhak, F.; Yurkovskij, Ya.; Yutlandov, I.A.; Churakov, A.K. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781331.

Submitted to the journal Instrum. Exp. Tech. .

For studying timing properties of a wide-aperture planar detector of high purity Ge-HPGe the coincidence spectrometer has been designed in one of the channels of which the scintillation and in the other - semiconductor detector have been used. The investigations have been carried out in the three-dimensional time-energy analysis modes Esub(γ)-T-Tsub(β). In the spectrometer standard electronics units are used. The possibility of using light diode for control and stabilization of a time channel and electronic units connected with them is demonstrated. It is shown that at the attained time resolution the detector combined with the scintillation spectrometer can be applied for determining the lifetime of isomeric nuclei states in nanosecond and submicrosecond ranges.

39992 **(JINR—13-84-373) Multichannel threshold gas Cherenkov counter placed in the spectrometric magnetic of the BIS-2 facility.** Gus'kov, B.N.; Zinchenko, A.I.; Kapishin, M.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701665.

Submitted to the journal Instrum. Exp. Tech. .

A seven-channel threshold gas Cherenkov counter with air filling at atmospheric pressure is described. The counter is placed in the gap of the analysing magnet of the BIS-2 spectrometer. The length of the counter radiator is 270 cm. The box and all components of the counter are made of nonmagnetic material. Thin elliptic mirrors 70 x 17.5 cm in size with curvature radii of 200 cm and 141 cm in two mutually perpendicular planes and XP-2041/Q photomultipliers are used in the counter. The photomultipliers are shielded from the magnetic field by means of individual magnetic screens made of ferromagnetics and solenoids. For $\beta >= 0.99982$ the detection efficiency of charged particles is 98%. The counter is part of a system for identification of charged particles from the BIS-2 spectrometer.

39993 **(JINR—13-84-375) Light output as a function of ionization density for a scintillator on polysterene basis.** Vorob'eva, N.N.; Gazdzitskij, M.; Golokhvastov, A.I.; Zhil'tsova, L.Ya.; Lukstin'sh, Yu.; Matveeva, E.N.; Khorozov, S.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 3p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781291.

Parameter B described the scintillator type from the Birks formula dL/dx approximately dEydx/1+BxdE/dx, which describes differential light output as a function of ionization density, has been determined. The measurement was performed for organic scintillators (polystyrene, terphenil-2%, POPOP-0.05%). The B parameter was determined by measuring the ratios of signal amplitudes from α- and β-sources. The obtained value of B = 0.009 +- 0.001 g/MeV/cm^2 is good agreement with the data obtained for other organic scintillators. Using the data obtained, the possibility of electron background suppression in soft proton detection was estimated. 7 references, 2 figures.

39994 **(JINR—13-84-382) Amplifier-pulse shaper with symmetric feedbacks for drift chambers.** Omel'yanenko, A.A.; Barabash, L.S.; Omel'yanenko, M.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781292.

Structural scheme for connecting an amplifier-pulse-shaper of the type of differential detector with symmetric feedbacks versus voltage is suggested. The amplifier-pulse shaper has been tested for different types of drift chambers. The tests have shown good noise immunity and high speed of response of the circuit. A possibility of stable operation at lower thresholds of actuation has arisen. 7 references, 3 figures.

39995 **(JINR—13-84-394) Electrodeless drift chamber in particle fluxes more than $10^5 s^{-1}$ per wire.** Budagov, Yu.A.; Nagajtsev, A.P.; Omel'yanenko, A.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781293.

Electrodeless drift chambers employing no electrodes for shaping a linearly decreasing field have been tested. The main purpose is to determine the efficiency of the chamber at the particle flux of 10^4 - $1.5x10^5$ s^{-1}. The efficiency does not vary no more than 99% up to 6 - 7 x 10^4 particles^{-1} but with a further increase of the loading it decreases to 70%. The drift rate negligibly decreases at large loadings, deflection of the measured coordinate from the true one equals 0.6% at the 1.5 x 10^{-5} s^{-1} particle flux. Spatial resolution is practically independent of the loading of the chamber. It is stated that electrodeless drift chambers can reliably operate in particle fluxes up to 10^5 s^{-1}. This advantage in combination with a simple design, small number of data channels, good spatial resolution and linearity makes the electrodeless chambers especially efficient in experiments with large spectrometers. 7 referenes, 10 figures.

39996 **(JINR—13-84-395) Time-of-digit converter with nanosecond resolution.** Budagov, Yu.A.; Semenov, A.A.; Seman, M.; Shpalek, J.; Sitar, B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781294.

A time-to-digit converter (TDC) comprising three data channels and one stop-channel is described. Each of the data channels comprises: time interpolator, double buffer register, fast response memory with capacity of 256 words by 7 digit places. Control of operation modes and conversion processes are realized by the control scheme. The TDC ensures measurement of the time position of signals in the range up to 16.384 μs with accuracy up to 1 ns at time intervals between pulses equal to 64 ns. The TDC is manufactured in the CAMAC standard and is used in drift chambers with the maximum drift length equal to 40 cm. 10 references, 3 figures.

39997 **(JINR—13-84-542) Charge collection time effecting energy and time resolution of semiconductor detectors.** Zinov, V.G.; Morozov, V.A.; Stegajlov, V.I.; Yashin, S.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781334.

Submitted to the journal Nucl. Instrum. Methods.

The effect produced by the charge collection time upon the time and energy resolution of semiconductor detectors has been studied. It is shown that gating of pulse rise times permits one to identify in coaxial detectors a group of pulses, corresponding to detection of radiation in surface layers of the detector. Choice of pulses with the maximum pulse rise time allows one to improve time resolution of the coincidence spectrometer and achieve 2 r= 1.65 ns instead of 2r = 5.50 ns for coincidence of the 1332 keV gamma line and β-particles from ^{60}Co.

39998 **(JINR—13-84-582) Deuterium track sensitive target in a working volume of hydrogen bubble chamber.** Bogomolov, N.V.; Bulanov, N.F.; Bushuev, Yu.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781295.

An improved deuterium track sensitive target built in the Ludmila chamber and operating modes of the installation intended mainly for the study of anti dd-interactions are described. Target (100 x 16 x 16 cm^3) prepared from a sheet polycarbonate is placed in the chamber volume. It is supplied with autonomous systems for thermostatic control and expansion of detecting medium. The chamber and target are filled with hydrogen and deuterium, respectively. Approximately 300 thousand images are obtained in the separated antideuteron beam of IHEP synchrotron. The parameters of

stable regime for deuterium and hydrogen are determined: deuterium temperature should be by 3.5-3.7 deg higher than that of hydrogen, pressure is lower by 0.03-0.05 MPa than that in the chamber during particle dump. The physical installation - the bubble chamber with two track sensitive volumes, has been constructed, in which for the first time the regime of synchrotronous track sensitivity of media with noncoinciding thermodynamic parameters has been realized. 6 references, 6 figures, 1 table.

39999 **(JINR—13-84-604) Multi-prong star detection efficiency in a streamer chamber triggered by a hodoscopic detector.** Abdullin, S.K.; Pontekorvo, D.B.; Falomkin, I.V.; Shcherbakov, Yu.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 3p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781296.

The program allowing one to calculate multi-prong star detection efficiency in a streamer spark chamber triggered by a hodoscope counters has been created for data processing of inelastic scattering of pions on helium. The program performance is demonstrated in Monte-Carlo calculations of multi-prong star detection efficiency. General Monte-Carlo phase-space program FOWL is used to generate events. It is shown that in the $\pi^{+-} + {}^4He \rightarrow \pi^{+-} + p + {}^3H$ type reactions protons make an essential contribution to the magnitude of efficiency. Good agreement with the results previously reported has been obtained in particular case of elastic scattering. 6 references, 3 figures.

40000 **(JINR—13-84-605) Scintillation time-of-flight spectrometer on-line with KM 001 microcomputer and SM-3 minicomputer.** Abdullin, S.K.; Lyashenko, V.I.; Falomkin, I.V.; Shcherbakov, Yu.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781297.

The time-of-flight spectrometer for unseparated beam of mean and low-energy antiprotons (100-300 MeV) has been constructed. Counting characteristics have been investigated on a bench with a light emitting diode. Spectrometer resolution is 320 ps (full width on a half maximum), counters being irradiated by cosmic mesons. The spectrometer operates on-line with the CAMAC KM001 microcomputer and the SM-3 microcomputer. It allows one to obtain and process time-of-flight spectra in the dialogue regime. 13 references, 3 figures.

40001 **(JINR—13-84-652) Investigation of characteristics of proportional chambers filled with some gaseous mixtures.** Azhgirej, L.S.; Zrelov, P.V.; Ignatenko, M.A.; Mitsyn, G.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1984. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781298.

The results of experimental investigation of the efficiency, noises and multiwire response of the proportional chamber filled with gaseous mixtures of argon+neon+30%CO_2 at different argon and neon concentration, and with argon+30%CO_2+freon-13B_1 at different freon concentrations are given. The dependence of the efficiency on the plateau against freon concentration in argon+30%CO_2+freon-13B_1 mixture is obtained. The influence of benzene, isopropyl and ethyl alcohol additions on the chamber noise is investigated. The conclusion is made that the proportional chamber characteristics are improved due to the Penning effect as the argon concentration in argon+neon+30%CO_2 mixture is increased. 20 references, 5 figures.

40002 (JINR—D-1-83-541, pp 84-93) **Calorimeters for electron and photon detection in colliding beam experiments.** Belousov, A.S.; Rusakov, S.V. (AN SSSR, Moscow. Fizicheskij Inst.). 1983. (In Russian). NTIS (US Sales Only), PC A07/MF A01. File Number DE85780971. (CONF-8312107—).

From Working conference on colliding beams experiments programme; Dubna, USSR (1 Dec 1983).

Designs and characteristics of electromagnetic calorimeters used in colliding beam experiments are briefly reviewed. Hodoscopes of shower Cherenkov detectors, heavy scintillators laminated detectors employing scintillators, detectors with charge collection and liquid argon calorimeters are described. Peculiarities of these detectors and some of their comparative characteristics are presented.

40003 **(JINR—D-1-84-405) Some performance of plastic streamer tubes.** Vodop'yanov, A.S.; Vojtkovska, I.; Golovatyuk, V.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781343.

Submitted to the journal Nucl. Instrum. Methods.

Some performances of plastic streamer tubes similar in design to detectors of a hadron calorimeter of the DELPHI installation are given. The investigations have been conducted with the bench for testing the prototype of the DELPHI hadron calorimeter at the JINR synchrotron beam. The equipment operated on-line with the EC-1040 computer. The conducted bench tests have shown the stability of operation of plastic streamer tubes, their simplicity and convenience of operation.

40004 (JINR—D-7-83-644, pp 449-464) **Fission studies with new instruments at I.L.L.** Gonnenwein, F. (Institut Max von Laue - Paul Langevin, 38 - Grenoble (France)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

To study fission processes with high resolution and efficiency the instruments called "Cosi fan tutte" and "DIOGENES" were built at Institute Laue-Langevin, Grenoble. The design of the instruments are shown. First test results are presented. The instrument COST FAN TUTTE will study thermal neutron induced fission reactions and take velocities, kinetic energies, final masses, initial masses, neutron emission numbers and nuclear charges of fragments. The "Cosi fan tutte" comprises a combination of a time-of-flight device and an energy detector for each of the two fragments. The facility "DIOGENES" is made up from two toroidal concentric ionization chambers surrounding the fissile targets. The inner chamber is to detect the fragments kinetic energies and emission angles while the outer one identifies the ternary light particle and measures their emission angles and residual energies. A first experiment has been run for $^{233}U(n, f)$. Some 2 x 10^6 ternary fission events have been collected. The data are under evaluation and some preliminary results are given.

40005 (JINR—D-7-83-644, pp 465-472) **Experimental study on the fission characteristics of weakly excited heavy nuclei in heavy ion reactions.** Zodan, Kh. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Correlation equipment is being prepared to investigate the interaction of heavy ions with energies $>=6$ MeV nucleon with nuclei on a new JINR U-400 heavy ion isochronous cyclotron. Time-of-flight spectrometers to study heavy reaction products are the basis of this equipment. Ionization chambers with a large inlet window with positioned sensitivity are applied as particle kinetic energy detectors. The main parameters of ionization chamber with time resolution of 400 picosec. are given. To investigate the fission mechanism in heavy ion reactions mass distribution of fission fragments in the range of nuclei heavier than uranium is studied. In the case of fission of the composite ^{253}Fm nucleus produced during ^{249}Cf irradiation with 28 MeV and 36 MeV, ^4He ions it was found that contributions of symmetric and asymmetric fission ratios are 0.25 and 0.32 respectively. The results obtained prove the data of other authors on the increase of the probability of symmetric fission of excited nuclei from uranium to fermium with the increase in the mass of fissile material.

40006 (JINR—D-7-83-644, pp 473-476) **Facility for determination of total kinetic energy and anti ν of spontaneous fission for short living transfermium isotopes.** Nad', Sh.; Chepigin, V.I.; Nasodi, M.; Domanov, V.P.; Ter-Akop'yan, G.M. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

To obtain information on the energy of deformation of fission fragments of transfermium isotopes in the correlation with prompt neutrons, a binary ionization chamber for the measurement of emission angle of fission fragments relative to cathode plane, is developed. A range chamber is placed into the ionization chamber having lavsan windows in the 5 mm cathode plane. Two identical chambers with parallel electrodes have a common cathode, screen grids in front of anode and signal grids in front of screen grids which serve to determine the emission angle of fission fragments. The cathode-signal (first) grid-screen (second) grid-collecting electrode distances are 32.7 and 10 mm, respectively. The grids are made of nichromium wire 100 μm thick, which is wired with the spacing of 1.5 and 1.0 mm for the first and for the second grid respectively. Chamber characteristics are: angle resolution 3-8 deg, energy resolution 1.5%, mass resolution 2-3 a.m.u. Results of model experiments are presented. Spectra of ^{235}U fission fragments, those of distribution of fission fragments in mass and total kinetic energy, are measured.

40007 (JINR—D-13-84-53, pp 136-138) **Unit for two-dimensional address formation in fast monitoring problems during multiparameter mesurements.** Sukhov, A.M.; Sokolova, N.V. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

Unit for two-dimensional address formation at fast monitoring in the recording systems of fission fragment mass taking into account time-of-flight is described. The unit is applied for coupling with the two-dimensional analyzer-monitor operating parallel with the main data acquisition system. The unit using synchropulses of analog-to-digital converters (ADC) directed into the computer fast memory, "intercepts" parameter codes and forms the two-dimensional address sent then into the analyzer storage. The total matrix of two-dimensional addresses has 64x64, 32x128, 16x256, 8x512, 4x1024, and 1x4096 channel dimensions. There is also a possibility of recording two independent spectra of 1024 channels each.

40008 (JINR—D-13-84-53, pp 142-145) **Multiplex measuring of amplitude and time parameters.** Zamrij, V.N. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The methods and apparatus for spectrometry and diagnosis of high-speed processes with a great number of measured and analysed amplitude and time parameters are briefly considered. Some characteristics of measuring channels with the interrogation time of 100 and 10 μs per a given parameter are presented. The channels comprise multiplexers of analog signals of high level; analog converters of amplitude and time intervals into voltage signal. The modules are realized in the CAMAC standard and they can process data from more than 100 channels.

40009 (JINR—D-13-84-53, pp 129-130) **Unit for coincidence multiplicity coding for a time-of-flight neutron spectrometer.** Markov, D.A.; Tsitovich, A.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

For multidimensional system of the linear accelerator neutron spectrometer a unit for coincidence multiplicity coding calculated for maximum number of detectors, equal 63 is designed. In the spectrometer system the unit is used in conjunction with the time coder using minimum channel width of 40 ns. The unit is realized in the CAMAC standard, supply voltage +- 6 V, dead time 3.2 μs.

40010 (JINR—D-13-84-53, pp 262-267) **Requirements for gamma spectroscopic equipment for IAEA safeguards.** Arlt, R. (International Atomic Energy Agency, Vienna (Austria)). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

General requirements for γ-spectroscopic equipment used for nondestructive testing of nuclear materials are discussed. Described briefly are methods and requirements for equipment and supply with electronics for NaI(Tl) and Ge detectors applied for determining U enrichment, Pu isotopic analysis, spent fuel, densitometry, X-ray fluorescence analysis. Flowsheets of data processing on γ spectroscopy according to the IAEA safeguards are given. Trends in the development of γ-spectroscopic equipment to this end are briefly described.

40011 (JINR—D-13-84-53, pp 268-271) **CAMAC based microcomputer data acquisition system for low energy nuclear physics applications.** Gmuca, S.; Morhac, M.; Ribansky, I. (Slovenska Akademia Vied, Bratislava (Czechoslovakia). Fyzikalny Ustav). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The system for data acquisition and analysis in low energy physics laboratory applications is developed. The system realized in the CAMAC standard consists of a TPA-70 minicomputer and ND4420 multi-channel analyzer used in nuclear spectroscopy. The software consists of two programs and is applied for data acqisition in the real time scale, data output onto display and data processing in the off-line mode. The block-diagram and main requirements for the system development are given. As the operation experience has shown, major design requirements have been met.

40012 (JINR—D-13-84-53, pp 293-297) **Microcomputer-controlled set-up for measurements of differential neutron cross sections.** Poethig, J.; Meiling, W.; Seidel, K. (Technische Univ., Dresden (German Democratic Republic). Sektion Physik). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The device for measurements of neutron scattering cross sections is described. The CAMAC device is controlled by the PMS 4944 microcomputer. The device block-diagram is given. Separate units of the device and software are briefly described. The data of measurements of neutron scattering cross sections on carbon and polyethylene are given.

40013 (JINR—D-13-84-53, pp 353-357) **Double beta decay research with a Ge(Li) detector.** Bellotti, E.; Cremonesi, O.; Fiorini, E.; Liguori, C.; Pullia, A.; Sverzellati, P.P.; Zanotti, L. (Milan Univ. (Italy)). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The gas detector for the ^{136}Xe neutrinoless double beta-decay is considered. The detector consists of 61 proportional hexahedral counter. The counter net volume is 9.2 l, filling gas is ^{136}Xe, pressure is 30 atm. Anode voltage is 6 kV at the gas amplification factor of 100. The transducer is to be set up in an underground chamber at a depth corresponding to 800 m of water with the 10 cm Pb and 3 cm W shielding. Preliminary calculations have shown that almost all electrons with 2 MeV energy produce an effect in two neighbouring cells. The expected effect is 220 events a year.

40014 (JINR—D-13-84-53, pp 350-352) **Multicell proportional counter for the ^{136}Xe neutrinoless double beta-decay.** Kuz'minov, V.V.; Novikov, V.M.; Pomanskij, A.A. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

Some Ge(Li) detector characteristics for detecting neutrinoless double beta decay are briefly considered. The detector has been installed inside Mont Blanc at a depth of 1600 m which corresponds to the shield provided by 5000 m of water. In addition there is a shielding of 25 cm Pb and 4.5 cm Hg. The counting rate for the 500-12000 keV energy range varies from 4.2×10^{-8} to 2×10^{-7}. Amplitude resolution is 1.6-2.63 keV.

40015 (JINR—D-13-84-53, pp 358-361) **General concepts of the NG-3 goniometer design and coupled electronic control system.** Elizarov, O.I.; Zhukov, G.P.; Ondrejchka, K.; Salamatin, I.M.; Khrykin, A.S. (Joint Inst. for Nuclear Research, Dubna (USSR)); Erzhabek, Ya.; Shimane, Ch.; Shul'ts, V. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia)). 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The system of adjustment and control by goniometer used in spectrometer for investigating neutron diffractography is briefly described. The two-stage system of angle adjustment is accepted by which the goniometer circle position is determined by the 15-bit word. It the first stage the angle is adjusted by pitches, the accuracy of which is ensured by amplying more gearing (8 bits). At the second stage the angle is adjusted in the limits of a pitch by the system of micrometer screw up to hundredth fraction of the pitch (7 bits). From the viewpoint of control the goniometer can be considered as a totality of circle rotation control systems. Each system has its own address and storage for specifying the ordinal number of a pitch and location of the microscuew. The block-diagram of the control system, the block-diagram of the goniometer coupling with controlling microprocessor and those of control program are presented.

40016 (JINR—D-13-84-53, pp 405-409) **Programming for a CAMAC gamma-spectrometer.** Kapisovsky, V.; Jancik, O.; Tinak, I. (Komenskeho Univ., Bratislava (Czechoslovakia)). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The program block-diagrams are given and software for multichannel analysers realized in the CAMAC standard on the base of the ES 1010 mini-computer and INTEL 8080 microcomputer is briefly described. Both systems are applied in γ-spectrometry, the second one being used as a transportable device. The software of the first system is realized in FORTRAN while that of the second one - in ASSEMBLER.

40017 (JINR—D-13-84-53, pp 437-441) **Large capacity computer in relativistic nuclei spectrometers.** Bazylev, S.N.; Kolpakov, I.F.; Senner, A.E.; Smirnov, A.A. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The processes of data acquisition and processing in case of nuclear physics investigations are briefly described. The data acquisitions and processing system is based on the ES-1040 computer. It is shown that using three emulators (instead of one) on line with the computer ensuper increase of measurement computer complex efficiency four times with the corresponding decrease of experiment cost two times and permits to obtain final result during the spectrometer operation interruption.

40018 (JINR—D-13-84-53, pp 442-447) **Spectrometric research automatization in the JINR nuclear problem laboratory.** Brudanin, V.B.; Vylov, Ts.; Zhuravlev, N.I.; Ignat'ev, S.V.; Medved', S.V.; Petev, P.; Salamatin, A.V.; Sidorov, V.T.; Sinaev, A.N.; Churin, I.N. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The three-level on-line measurement system for spectrometric research automatization is described. The basis of the lower level are spectrometers for measuring energy, time and spatial radiation distribution of and correlations between them. One-dimensional, multidimensional, as well as precision spectrometerst for the analysis of electron spectra in the 0.5-50 keV energy range are used. The spectrometers operation is controlled by microcomputers; electronics is realized in the CAMAC standard. The data collected by the spectrometers are transmitted to the second level based on the ES-1010 computer where preliminary data processing occurs. The third level basis is the ES-1040 computer operating in the multiprogram mode. For ensuring the performance of the system, processing and analysis of spectrometric data softtware is created at all levels.

40019 (JINR—D-13-84-53, pp 452-457) **Measurement centre development of the Nuclear Physics Department.** Fromm, V.D. (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The computering centre of the Central Institute of Nuclear Research in Rossendorf (GDR) is briefly described. The complex of acquisition-computer facilities consists of central computer and peripheral mini- and microcomputers. For experiment control and monitoring the CAMAC equipment is used. Some characteristics of multi-channel analyzer on the base of the AMCA-80 crate are given. For presentation of two-dimensional distributions the FD 4971 colour display is used.

40020 (JINR—D-13-84-53, pp 458-462) **Mini- and microcomputer local network design for control and physical researches.** Kutsenko, V.A.; Fedotov, O.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

A design of mini- and microcomputer local network which must ensure common use of external devices, files, programs and interconnection between the problems is discussed. The circular network topography with the distance between units from some tens to hundreds of meters, total length 1-2 km. For the communication line control and monitoring the method called "register insertion" has been selected. The coupled processor (controller) combined with the transmitter-receiver realizes hardcopy logs of the lower levels. The controller is constructed on the base of the 16-bit microprocessor. The RT-11 operation system is assumed as software basis. The FB monitor simultaneously maintaining the processing up to 8 problems is used for operation.

40021 (JINR—D-13-84-53, pp 151-154) **Stabilized high-voltage power supply for proportional and drift chambers.** Strmen', P.; Feshchenko, A.A. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The stabilized high-voltage power supply source for proportional and drift chambers is developed. The source power supply voltage is +-6 V, +-24 V, output voltage range is 0-6 kV, maximum output current -0.5 mA, output voltage pulsations amplitude is less than 1 V. The source is realized on integrated microcircuits in the CAMAC standard.

40022 (JINR—D-13-84-53, pp 184-188) **168/E microcomputer application for experimental data processing.** Smirnov, V.A. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

In the SLAC laboratory (USA) the analysis of the system of several parallel processors for accelerated data processing from transducers of high energy physics experimental facilities is performed. The data processing is realized by the IBM-370 computer and parallel by one or several 168/E processors which are designed on the base of the AMD 2901 microprocessor. The 168/E specific feature consists in emulation of IBM-370 commands by microcodes that are performed by software. For obtaining microcodes which then are loaded in the 168/E processor memory a special translator is applied. The conclusion is drawn that the parallel data processing is most efficient at time periods of problem solution more than 0.2 C. There exists an optimum number of processors which should be used for parallel data processing.

40023 (JINR—D-13-84-53, pp 234-238) **Microcomputer based charge-to-digital converter and data acquisition system for measurements of fast time-varying radiation fields.** Jaszczuk, J.; Mrozinski, P. 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The equipment for radiation fields detecting is described. The equipment consists of ADC and a microcomputer and operates in common with the ionization chamber. The measurement results are displayed and are presented in a digital form. ADC has the following characteristics: charge of a single pulse 10^{-14} C slope of charge characteristic 100 pulses/pC, slope of the current characteristic 100 pulses/sec/pA. The equipment measures currents in the 10^{-12}-10^{-9}A range with 2% error. At the ionization chamber sensitivity of $5x10^{-8}$ C/Gy radiation rates from 1 to 1.10^{3} m Gy/min can be measured. The equipment is meant for use by medical centres performing cancer cure.

40024 (JINR—D-13-84-53, pp 312-316) **Computerized fluorescence analysis system-CFAS.** Dzieglewski, G.; Czarnacki, W.; Gize, A. (Institute of Nuclear Research, Warsaw, Poland). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The concept of a device for computerized fluorescents analysis is considered. The device analyses the elements from Na to Pu, exposition time is 100-300 s, concentration of detected inclusions up to 10 PPM, multi-element analysis of liquid, powder and solid samples is possible. The block-diagram of the device is presented. The CAMAC electronics is based on the NEPTUN-184 microcomputer. The radiation source is an X-ray tube. Radiation detection is performed by Si(Li) or Ge detectors. The device is now in developing stage.

40025 (JINR—D-13-84-53, pp 335-337) **Autonomical programmed system of the radiometrical probe.** Dargiel, Z.; Jamrogiewicz, T.; Padee, L. (Politechnika Warszawska, Poland). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

Described is the system for determining concentration of labelled isotopes consisting of three parts: radiometrical for γ-radiation detecting by means of scintillation detectors, microcomputers for data acquisition and data transmission, radio-telephone for commands reception and data transmission. The radiometrical probe with software comprises a scintillation detector, photomultiplayer, preamplifier and high voltage source, pulse amplifier, discriminator, pulse counter, INTEL 8080 microcomputer as well as electric battery ensuring 45 h of operation time. Software, ensuring system control, and data storage are briefly described.

40026 (JINR—D-13-84-53, pp 338-344) **Utilization of minicomputer in the radiocarbon analysis measurements.** Szarka, J.; Krnac, S. (Komenskeho Univ., Bratislava, Czechoslovakia). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

Possibilities of minicomputer applications for radiocarbon analysis with multielement proportional counters are considered. Off-line on-line measuring system operation is possible. TPA-70 minicomputer and CAMAC electronics are used in on-line operation. Block-diagrams of data acquisition and data processing as well as the block-diagram of data evaluation program, which permits not only to increase the precision of the measurements, but also reduces the measuring time by 1/3, as compared with conventional methods, are given.

40027 (JINR—D-13-84-259) **Testing technique for streamer tubes of the DELPHI (LEP) hadron calorimeter.** Alekseev, G.D.; Kruglov, V.V.; Kulinich, P.A.; Mitsel'makher, G.V.; Ol'shevskij, A.G.; Zyazyulya, F.E. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781344.

Submitted to the journal Delphy Notes, CERN.

The method is considered to control the homogeneity of signal and high-resistive cathode coating along the total streamer tube surface by means of mobile X-ray source. The high-voltage training and wire tension measurement are biefly discussed. The methods considered make it possible to automatize testing procedure for streamer tubes by using a widespread and cheap equipment.

40028 (JINR—E-1-84-444) **Analysis of V^0-events registered in the streamer spectrometer SKM-200.** Gazdzicki, M.; Iovchev, K.; Okonov, E.; Tymieniecka, T. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781283.

Methods of scanning, measurement, identification and correction used to obtain results on the Λ- and Ksub(ssup(0)-particles produced in nucleus-nucleus inelastic and central interactions detected with the SKM-200 streem spectrometer are described. The central nuclear collisions were selected using the special triggering system. The identification has been made by fitting the kinematic equations (3C-fit) and the shape of chi^2-distribution appeared to be in good agreement with the expected ones. The additional criteria for the identification has diminished the background v ^{0}-admixture up to 3% for Λ-sample and up to 7% for the Ksub(s)sup(0) -samples. That has been taken into account to estimate the yields of these particles. 11 references, 10 figures, 3 tables.

40029 (JINR—E-13-84-473) **Optical filtration of laser track shadowgrams in streamer chamber.** Falomkin, I.V.; Ivanov, I.Ts.; Shcherbakov, Yu.A.; Iova, I.; Tudor, T.; Vinkler, I.; Sporea, D. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1984. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701664.

Submitted to the Nucl. Instrum. Methods.

The application of optical filtration method for improving the electron track laser shadowgram is described. The tracks are registered by streamer chamber working in self-shunt regime. Because of the diffraction pattern of the wire electrodes, the track shadowgram is suppressed by it, but filtration helps to clean the track image from this noise component.

40030 (JINR—E-13-84-640) **Monte-Carlo simulation for the showers in the DELPHI (LEP) hadron calorimeter.** Alekseev, G.D.; Tkachev, L.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781284.

Monte-Carlo simulation for shower formation is performed for a hadron calorimeter consisting of iron layers with inserted plastic streamer tubes. It is shown that the dead zone effect local-

ized on anode wires in the places of streamer formation changes essentially both the calorimeter response and the effective transversal size of the shower. The response variation with the value and direction of the magnetic field corresponding to DELPHI hadron calorimeter achieves 20%, which causes the necessity of additional calorimeter calibration in the magnetic field. 6 references, 8 figures, 2 tables.

40031 **(JINR—R-1-84-546) Wide-gap drift chamber with field-forming electrodes on fibreglass.** Budagov, Yu.A.; Nagajtsev, A.P.; Omel'yanenko, A.A.; Semenov, A.A.; Chirikov-Zorin, I.E.; Hlinka, V.; Sitar, B.; Spalek, J.; Artykov, A.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781285.

A drift chamber with a 100 mm electron drift length and field forming electrodes on fibre-glass walls is described. The chamber with a large drift length is designed in order to decrease the number of electronic channels while maintaining a high spatial resolution. A high efficiency has been achieved all over the chamber. Spatial resolution is 0.25 mm at the 40 mm drift length. A good linearity has been obtained in the drift time-position relation. The chamber characteristics do not change up to particle flux of 1.5 x 10^5 s/per wire. Pulse height is proportional to the ionization losses in the chamber, according to measurements of π- and K-meson and proton beams. The wide-gap drift chamber is a reliable and accurate coordinate detector. 3 references, 7 figures, 1 table.

40032 **(JINR—R-3-84-219) Modulation of ultracold neutron flux by means of thin-film ferromagnetic shutter.** Novopol'tsev, M.I.; Pokotilovskij, Yu.N.; Shelkova, I.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1984. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781307.

The modulation of ultracold neutron flux is measured with the help of the two and four-layer thin film ferromagnetic shutters having the structure: permalloy (50% iron - 50 nickel)-silicon-% n iron. The modulation depth of the flux as much as 8 has been achieved for four-layer system. The possible application of developed shutters are pointed out in experiments on observation of nonstationary phenomena with ultracold neutrons and for high resolution correlation spectroscopy of slow neutrons. 7 references, 2 figures.

40033 **(JINR—R-6-84-554) Sensitivity of experiment on search for neutrinoless double beta-decay by using semiconductor detectors.** Vylov, Ts.; Brudanin, V.B.; Briancon, Sh. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781329.

An estimate of the sensitivity of the experiment on the search for 2βsub(0ν)-decay by using telescope counters of 32 HPGe detectors is made. The transmission of electrons through thin foils is investigated experimentally. The obtained results are compared with the theoretical calculations. It is shown that under the given assumptions, using telescope counters of 32 HPGe detectors and sources of 25 mg/cm^2 thickness lim Tsub(1/2)sup(0ν)(sup(48)Ca) approximately 9x10^{21} y and lim Tsub(1/2)sup(0ν)(sup(76)Ge) approximately 2.8x10^{23} y are obtained.

40034 **(JINR—R-10-84-440) Software for data acquisition system of the DN-2 diffractometer at the IBR-2 pulsed reactor.** Balagurov, A.M.; Mironova, G.M.; Ostrovnoj, A.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781305.

A new version of software for acquisition, storage and representation of data received from the DN-2 neutron diffractometer is described. This software is developed using technique of data base application in experiment automation systems. The software provide an improved reliability of the measurement procedure, ability of easy and infallible experimenter's intervention into the process of the experiment procedure. The technique of data base application allowed to provide a unified access of a great number of programs to experimental data. The described programs are written in Pascal programming language for the SM-3 computer. 6 references, 2 figures.

40035 **(JINR—R-13-84-239) Problem of self-quenching streamer and limited-Geiger modes in wire detectors.** Alekseev, G.D.; Kruglov, V.V.; Khazins, D.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 2p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781286.

Gas discharge photographs obtained earlier are discussed. An opinion has been expressed that there are no reliable arguments for exestence of stable limited-Geiger mode. 6 references, 1 figure.

40036 **(JINR—R-13-84-249) Shock tensometer for multiwire chambers.** Zyazyulya, F.E.; Korenchenko, S.M.; Smirnov, V.S. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781287.

A new method for wire tension measurement by shock excitation of mechanical vibration and determination of its period is proposed. The circuit of an automatic electronic shock tensometer which provides a high productivity and operational possibility under unaccessibility of multiwire chambers is described. 8 references, 5 figures.

40037 **(JINR—R-13-84-285) Holographic bubble chamber in a proton beam.** Bakanov, L.V.; Vorob'ev, B.A.; Lebedev, V.D.; Logak, L.G.; Najdenkov, A.F.; Zubarev, A.N.; Kochurov, A.G.; Sokolov, V.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781288.

The bubble chamber with a holographic readout is described. Its sizes are: diameter-65 mm, depth-40 mm, filling-freon (C_2H_5) operating temperature-46 deg C, pressure-21 atm. The Gabor scheme of obtaining holograms was used in the setup. The ruby laser with pumping (lambda = 694.3 ns), 30 ns length of light pulse, pulse energy of 0.3 Jsub(x) was used for illumination. The chamber was irradiated by the proton beam of a synchrophasotron. Quality holograms of proton-freon interacting are obtained. Density of bubbles in primary proton tracks was 120 cm^{-1}, that of secondary particles - 1000 cm^{-1}. Bubble diameter for growth time 10 mks is 10 mkm. The results of photometric measurements of bubble profile and photographs of restored from holograms events of proton-freon interaction are given. Bubbles of >=10 mkm diameter have a good contrast and clear boundaries. Tracks with bubble diameter of >=5-6 mkm are also registered in holograms. 5 references, 7 figures.

40038 **(JINR—R-13-84-454) System for automation of experiments on the search for rare nuclear decay events by detecting multiple neutron emission.** Zejnalov, Sh.S.; Sokol, E.A.; Smirnov, V.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1984. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781306.

A description is given of hardware and software of an on-line system designed to search for rare nuclear decay events by detecting multiple neutron emission. The system consists of a neutron detector, a cosmic radiation shield, CAMAC electronic equipment, MACAMAC and MERA-60-30 microcomputers. The system software provides the acquisition, analysis and presentation of experimental data. The communication between the experimentor and system is performed by means of interactive commands issued from the keyboard of videoterminal. 6 references, 4 figures.

40039 (JINR-D—13-84-53, pp 67-77) **Design of low-noise preamplifiers for some special applications in high energy experiments.** Gatti, E. (Politecnico di Milano (Italy). Ist. di Fisica); Inzani, P. (Milan Univ. (Italy). Ist. di Fisica); Manfredi, P.F. (Pavia Univ. (Italy)); Marioli, D. 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

Preamplifiers with a noise low level for processing signals coming from two telescopes on the base of silicon detectors for using in the OMEGA-Beauty experiment are described. One preamplifier is meant for the detector of 500 pF capacitance and uses 5 parallel transistors at the input stage. This preamplifier is intended for using in an anologous processor ensuring counting rate of 10^6 pulses per second. The second preamplifier-voltage preamplifier is applied for data acquisition and muliplicity measurement.

40040 (JINR-D—13-84-53, pp 92-95) **Fast processor for selecting elastic scattering events.** Grebenyuk, V.M.; Selikov, A.V. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The trigger of the second level which represents a special processor is briefly described. The described system is intended for ensuring the operation of the designed facility for measuring asymmetry in elastic scattering at high transmitted pulses up to 4.5 GeV/s^2 at the 40 GeV/s pulse of the incident π-meson. The first level trigger extracts pion beam. The second level trigger systems take into account geometric characteristics of the processes and serve to raise the effectiveness of the selection of events. The processor comprises two types of units: data recording and coding unit and selection unit. The first unit records the event and transforms the number of the operated channel into the 5-bit code. The second unit comprises coincidence matrix, selection circuit, timing units, CAMAC command decoder and registers of recording programs and reading numbers of operated channels. The block-diagram and some technical characteristics of the device are presented.

40041 (JINR-D—13-84-53, pp 96-99) **Fast processor for preliminary data processing in filmless readout systems of streamer chambers.** Krushinski, D.; Turzova, M. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The data compression equipment (DCE) for the filmless readout system of streamer chamber of the RISK device is briefly described. DCE is realized on the base of 16-bit fast processor consisting of two SORT and APROX processors interacting through the total memory array. SORT performs digitized coordinates data sorting according to their belonging to separate tracks and forms sorted-out data matrices. APROX creates packed data presentation which is SM-4 computer tape recorded. DCE operates on line with television chambers.

40042 **(LA-UR—85-2070) Los Alamos constant-Q spectrometer.** Robinson, R.A.; Pynn, R.; Eckert, J.; Goldstone, J.A. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 16p. (CONF-850762—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014115.

From 8. meeting of international collaboration on advanced neutron sources; Oxford, UK (7 Jul 1985).

A constant-Q spectrometer, which has been installed on the pulsed source of the Los Alamos Neutron Scattering Center, is described. It features a number of innovations that ease sample and analyser alignment and a novel composite crystal analyzer which exploits the mosaic properties of plastically deformed germanium in a new way. Observations of phonon dispersion in aluminium and of incoherent scattering in ZrH_2 are reported, along with background measurements. 11 refs., 5 figs., 1 tab.

40043 **(MPI-PAE/Exp.El.—147) Some possible improvements in scintillation calorimeters.** Lorenz, E. (Max-Planck-Institut fuer Physik und Astrophysik, Muenchen (Germany, F.R.). Werner-Heisenberg-Inst. fuer Physik). Mar 1985. 21p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85752027.

Two ideas for improvements of scintillation calorimeters will be presented: a) improved readout of scintillating, totally active electromagnetic calorimeters with combinations of silicon photodiodes and fluorescent panel collectors, b) use of time structure analysis on calorimetry, both for higher rate applications and improved resolution for hadron calorimeters.

40044 **(MPI-PAE/Exp.El.—149) Scintillator-lead photon calorimeter using optical fiber readout systems.** Fessler, H.; Freund, P.; Gebauer, J.; Glas, K.M.; Pretzl, K.P.; Seyboth, P.; Seyerlein, J.; Thevenin, J.C. (Max-Planck-Institut fuer Physik und Astrophysik, Muenchen (Germany, F.R.). Werner-Heisenberg-Inst. fuer Physik). Feb 1985. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85752026.

The construction and performance of a tower structured scintillator-lead photon calorimeter using a novel fiber optics readout system is described. An energy resolution of sigma/E = 0.10/$\sqrt{E}$ was obtained with incident electrons in the range of 0.5 - 5.0 GeV/c. The uniformity of response across the front face of the tower was measured. Results obtained with a silicon photo-diode are compared to those obtained with a photomultiplier.

40045 **(NUREG/CR—4239) Analysis of the ability of current health physics instruments to predict dose in exposed individuals.** Armantrout, G.A. (Lawrence Livermore National Lab., CA (USA)). Jul 1985. Contract W-7405-ENG-48. 313p. (UCID—20398). NTIS, PC A14/MF A01 - GPO. File Number TI85015800.

In this study, theoretical calculations of effective dose to body tissue using Monte Carlo simulation techniques have been performed for both gamma ray and beta ray irradiation. Similar calculations for neutron irradiation by other workers have also been reviewed. Evaluations were made of the performance of a series of the more common health physics instruments. In this evaluation, representative instruments for both gamma-ray and beta-ray survey work were evaluated using a series of calibrated radiation sources. These instrument evaluations were then compared against similar evaluations in the literature, and an evaluation of basic instrument response by type was performed. In addition, data on calculated health effects was used to evaluate the ability of these instruments to predict health effects. Key results for the gamma-ray, beta-ray, and neutron survey meters are given.

40046 **(REG/G—6-85-Draft) Guide for the preparation of applications for licenses for the use of radioactive materials in servicing preregistered gauges, measuring devices, and sealed sources used in such devices. Draft.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Regulatory Research). Jun 1985. 28p. US Nuclear Regulatory Commission, Washington, DC 20555. File Number TI85901688.

The purpose of this regulatory guide is to provide assistance to applicants and licensees in preparing applications for new licenses, license amendments, and license renewals. This guide describes the information the NRC staff needs to evaluate an application for a license for the use of radioactive materials in certain commercial services for other NRC or Agreement State licensees. The services covered by this guide are the installation, relocation, maintenance, repair, and performance of the initial radiation survey of preregistered gauging or measuring devices containing licensed material and leak tests, installation, replacement, and disposal of sealed sources used in such devices. This guide also covers other essential services, as appropriate, such as training customer personnel on the radiation safety aspects of the use of the devices and on NRC regulatory requirements as they pertain to the customer's licensed devices. This regulatory guide is intended to provide the applicant or licensee with information that will enable him to understand specific regulatory requirements and licensing policies as they apply to the specified services that he provides. The information in this guide is not a substitute for training in radiation safety. After being issued a license, the program must be conducted in accordance with (1) the statements, representations, and procedures contained in your application, (2) the terms and conditions of the license, and (3) the Nuclear Regulatory Commission's regulations. The information provided in the application should be clear, specific, and accurate.

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40047 **(RI—166) Improvement of the instrumental line shape of X-ray spectrometers with Si(Li) - detectors.** Berdikov, V.V.; Zajtsev, E.A.; Iokhin, B.S. (Radievyj Inst., Leningrad (USSR)). 1983. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781335.

The possibility of decreasing the background of the X-ray spectrometer detector using the rise-time pulse selection method was investigated. Si(Li)-detectors of 10 and 25 mm^2 square were investigated. Spectrometer channel was composed of ORTEC-472 amplifier and ULTIMA/2 multichannel analyzer on the base of NOVA-3 minicomputer. The energy resolution was equal to 300 eV on 14 keV line. The pulses of detection allowing were transmitted to analog-to-digital converter. The detection was allowed if front photopeak square) were measured at 17.4, 20.3 and 59.6 keV. 4-6-fold decrease of X-factor was obtained without any loss of detection efficiency. The combination of the method with collimation of radiation in the centre of the detector gives an extremely low value of X-factor which agress with theoretical estimations.

40048 **(SAAS—320) Automatic α-spectrometry using surface barrier detectors.** Czarwinski, R.; Loessner, V.; Klucke, H.; Krause, J. (Staatliches Amt fuer Atomsicherheit und Strahlenschutz, Berlin (German Democratic Republic)). 1984. 16p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701663.

A measurement system has been developed for the routine determination of transuranics in biosamples by α-spectrometry. It employs high-resolution surface-barrier detectors and can be operated automatically by means of an integrated CAMAC system. For ^{241}Am, the minimum detectable activity is 2.4×10^{-3} Bq.

40049 **(SRD-R—298) Standardisation of radon and thoron emanation measurements.** Cliff, K.D.; Meggitt, G.C.; Rhodes, T.; Ryden, D.J. (UKAEA Safety and Reliability Directorate, Culcheth). May 1984. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781326.

The report of the Working Group of the Advisory Committee for Radiological Protection Instrumentation.

Actinide in air monitoring has to be achieved against a background of airborne radon and thoron daughters which interfere with measurements. Radon and thoron originate in building materials and sub soil, and diffuse into the working air space. To reduce background levels the contribution from each source needs to be evaluated. This report critically examines techniques for measuring radon and thoron emanation rates from building materials and structures, and transmission efficiencies of radon and thoron through paints and other barriers.

40050 **Scintillation yields by relativistic heavy ions and the relation between ionization and scintillation in liquid argon.** Doke, T.; Hitachi, A.; Kikuchi, J.; Masuda, K.; Tamada, S. (Waseda Univ., Tokyo (Japan). Science and Engineering Research Lab.); Crawford, H.J.; Gruhn, C.R. (Lawrence Berkeley Lab., CA (USA)); Nagamiya, S. (Tokyo Univ. (Japan). Dept. of Physics); Shibamura, E. (Saitama Coll. of Health, Urawa (Japan)). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **235**: No. 1, 136-141(Mar 1985).

Scintillation yields per unit energy deposited by relativistic heavy ions in liquid argon have been measured. They are (1.41 +- 0.07) for 613 MeV/n Ne ions and (1.39 +- 0.07) for 705 MeV/n Fe ions, if the value is normalized to unity for 5.3 MeV alpha particles. These results show that the scintillation intensity for relativistic heavy ions in liquid argon is proportional to the deposited energy, that is, to Z_1^2, where Z_1 is the nuclear charge of heavy ions. Furthermore, the variation of ionization and scintillation in liquid argon has been investigated as a function of electric field using relativistic Ne and Fe ions. It is shown that a linear combination of ionization signal I and scintillation signal S, $I + aS$, is proportional to the deposited energy, independently of electric field strength and types of incident particles. This suggests that if we use both signals, we may construct a massive calorimeter that can be used for nuclear reactions induced by relativistic heavy ions.

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40051 **Reduction of reabsorption effects in scintillators by employing solutes with large stokes shifts.** Renschler, C.L.; Harrah, L.A. (Sandia National Labs., Albuquerque, NM (USA)). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **235**: No. 1, 41-45(Mar 1985).

It is shown how energy transfer losses due to reabsorption effects can lead to reduced light output in scintillators. The advantages of using solutes with very large Stokes shifts to reduce these effects are discussed and 3-hydroxyflavone is proposed as one such solute. Model scintillators are formulated to test this concept.

40052 **Measurements of the response of a hadronic calorimeter to beams of pions and protons of 1-10 GeV/c momenta.** Mincer, A.I.; Freudenreich, H.T.; Goodman, J.A.; Tonwar, S.C.; Yodh, G.B. (Maryland Univ., College Park (USA)); Berley, D. (National Science Foundation, Washington, DC (USA)); Ellsworth, R.W. (George Mason Univ., Fairfax, VA (USA)); Gabriel, T.A.; Bishop, B.L. (Oak Ridge National Lab., TN (USA)). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **235**: No. 1, 46-54(Mar 1985).

An ionization calorimeter was studied with a test beam at the Brookhaven Alternating Gradient Synchrotron. The purpose of the experiment was to calibrate the response of a similar but larger cross section calorimeter used to study high energy cosmic ray showers at the University of Maryland, College Park, Maryland. The beam momenta were between 1 and 10 GeV/c. Results of measurements of (1) the mean pulse height from a scintillator at different depths in the calorimeter, (2) the frequency of occurence of very rare events with pulse heights many times the mean pulse height and (3) the correlation of pulse heights from several scintillators at different depths are presented and discussed.

40053 **Determination of the absolute efficiency of an organic scintillator for neutrons with energies between 0.5 and 800 MeV.** Howe, S.D.; Lisowski, P.W.; Russell, G.J.; King, N.S.P. (Los Alamos National Lab., NM (USA)); Donnert, H.J. (Kansas State Univ., Manhattan (USA); Los Alamos National Lab., NM (USA)). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **227**: No. 3, 565-570(1 Dec 1984).

We have determined the absolute efficiency of an NE-213 scintillator for neutrons with energies from 0.5 to 800 MeV. The detector was 5.1 cm in diameter and 2.5 cm deep. The efficiencies were obtained for detector thresholds of 0.011, 0.48, 1.12, and 4.48 MeVee. Our results are compared to predictions of the STANTON computer code.

40054 **Commercial bacterial colony counter for semi-automatic track counting.** Griffith, R.V.; McMahon, T.A. (Lawrence Livermore National Lab., CA (USA)); Espinosa, G. (Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Fisica). *Nuclear Tracks;* **8**: No. 1-4, 215-218(1984). (CONF-830969—).

From 12. international conference on solid state nuclear track detectors; Acapulco, Mexico (4 Sep 1983).

The information one must obtain from a solid state track detector depends on the specific application. The most common information need is the measurement of track density. The number of tracks per unit area is commonly used in neutron and alpha dosimetry, for example, to determine radiation dose. In recent years, a class of semi-automatic counting systems has become available for under $15,000. These systems, usually developed for bacterial colony counting, are capable of measuring track density. The basic instrument is designed to count relatively large objects with low magnification using an illuminated stage. However, track counting can be done with an accessory television camera coupled to an optical microscope. Tracks from electrochemical etching can be counted easily with objectives as low as 2X.

40055 **Measuring the neutron energy spectrum of laser fusion targets with CR-39.** Lane, S.M. (Lawrence Livermore National Lab., CA (USA)). *Nuclear Tracks;* **8**: No. 1-4, 289-292(1984). (CONF-830969—). Contract W-7405-ENG-48.

From 12. international conference on solid state nuclear track detectors; Acapulco, Mexico (4 Sep 1983).

We are developing a detector capable of measuring the neutron energy spectrum from a laser fusion target containing DT fuel. From such a spectrum the compressed areal density of the DT can be inferred by observing the fraction of 14.1 MeV neutrons downshifted in energy by elastic scattering. The detector consists of a 0.1 cm thick Ta X-ray and debris shield backed by a 50 to 200 μm polyethylene radiator followed by layers of CR-39. The energy of each neutron producing a knock-on proton in the radiator, that in turn creates a damage track in the CR-39, can be derived from the resultant track diameter, location, and orientation. We have analyzed the proton sensitivity and sample readability of 5 types of CR-39 in the energy range 3 to 11 MeV and have found a type fabricated by American Acrylics from a monomer made by a French company, Allymer, to be the most acceptable. Calibration curves were obtained for this plastic at energies of 3 to 15 MeV and dip angles ranging from 75 to 90 degrees. These curves were subsequently used to unfold a 14.7 MeV spectrum generated at the Livermore Rotating Target Neutron Source.

40056 **Re-evaluation of the temporal response of CsI photocathodes.** Stradling, G.L.; Attwood, D.T.; Kauffman, R.L. (Lawrence Livermore National Lab., CA). *Proceedings of the Society of Photo-Optical Instrumentation Engineers;* **348**: 777-782(1982).

The optimization of photocathodes for ultra-fast x-ray detectors is an area of active interest in the x-ray diagnostic community. New evaluations of CsI and Au transmission photocathodes in side-by-side in situ streak camera measurements are discussed here. Temporal response of the two materials and sensitivity comparisons over a wide range of thicknesses are presented. 11 references.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

40057 (INIS-BR—279, pp 220) **Effective energies and exposure determinations of two different energy X-ray beams incident on a personnel monitor.** Okuno, E.; Cruz, M.T. da. (Sao Paulo Univ., Brazil). 1984. NTIS (US Sales Only), PC A10/MF A01. File Number DE85781265. (CONF-8408159—Vol.4).

From 4. Japan-Brazil symposium on science and technology; Rio de Janeiro;Sao Paulo, Brazil (6 Aug 1984).

The effective energy of one X or gamma ray beam can be determined by means of two thermoluminescent (TL) dosemeters mounted between suitable filters. However, it has been observed that personnel monitors exposed to two different energy ionizing radiations provide different effective energies depending on the type of TL phosphor used. This fact could be a powerful tool for identifying exposures to radiation with quite different effective energies which are very common in practice. Two types of TL dosemeters were used: pellets of cold pressed natural fluoride and NaCl developed in our own laboratory, and LiF, TLD-100 from Harshaw Chemical Co.. Experimental results obtained with these combined dosemeters after irradiation with different sets of exposures and energy values of ionizing radiations are also presented. (Author).

40058 (INIS-mf—9482, pp 86) **Activation energy of space charge capture centres in MOS dosemeter oxide layer.** Petr, I. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia). Fakulta Jaderna a Fysikalne Inzenyrska). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

40059 (LA-UR—85-2265) **Preliminary investigation of changes in x-ray multilayer optics subjected to high radiation flux.** Hockaday, M.P.; Blake, R.L.; Grosso, J.S.; Selph, M.M.; Klein, M.M.; Matuska, W. Jr.; Palmer, M.A.; Liefeld, R.J. (Los Alamos National Lab., NM (USA); Sandia National Labs., Albuquerque, NM (USA); New Mexico State Univ., Las Cruces (USA)). 1985. Contract W-7405-ENG-36. 9p. (CONF-850887—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014074.

From SPIE international technical symposium on optical and electro-optical engineers; San Diego, CA, USA (18 Aug 1985).

A variety of metal multilayers was exposed to high x-ray flux using Sandia National Laboratories' PROTO II machine in the gas puff mode. Fluxes incident on the multilayers above 700 MW/cm^2 in total radiation, in nominal 20 ns pulses, were realized. The neon hydrogen- and helium-like resonance lines were used to probe the x-ray reflectivity properties of the multilayers as they underwent change of state during the heating pulse. A fluorescer-fiber optic-streak camera system was used to monitor the changes in x-ray reflectivity as a function of time and irradiance. Preliminary results are presented for a W/C multilayer. Work in progress to model the experiment is discussed. 13 refs., 4 figs.

40060 (SAND—85-0742C) **Radiation effects hardening techniques.** Dawes, W.R. Jr. (Sandia National Labs., Albuquerque, NM (USA)). Jul 1985. Contract AC04-76DP00789. 86p. (CONF-850711—11). NTIS, PC A05/MF A01; GPO Dep. File Number DE85009813.

From 22. annual conference on nuclear and space radiation effects; Monterey, CA, USA (22 Jul 1985).

This section of the IEEE Tutorial Short Course will discuss techniques for radiation hardening semiconductor electronic components. The hardening techniques may include special process procedures and constraints, circuit designs, and system adaptations to achieve the desired level of radiation tolerance. The radiation sources considered include nuclear weapons, natural space environments, and nuclear reactors. Each of these sources offers a unique radiation spectrum requiring specific hardening techniques for the semiconductor technologies used and, equally important, specific testing procedures to verify that the desired radiation tolerance level has been achieved with confidence. The radiation spectrum for the various sources will be reviewed, with its particular characteristics. 39 refs., 32 figs.

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 38806, 39104, 39108, 39130, 39236, 39237, 39305, 39464, 39645, 39665, 39666, 39682, 39912, 39927, 40113

40061 (INDC(CCP)—222/L, pp 18-22) **Optimization of delayed neutron detection units for activation analysis of uranium and thorium.** Bertman, E.G. Nov 1984. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781274.

Russian original distributed as INDC(CCP)-207/G.

In Translation of selected papers published in Nuclear Constants, Volume 2(51), Moscow 1983.

Different neutron detection systems, suitable for set-ups of analyzing uranium and thorium in geological samples by the delayed neutron method, are discussed.

40062 (INIS-mf—9299, pp 74-78) **DIOGENE: A 4PI detector for studying central collisions of relativistic heavy ions.** Babinet, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Physique Nucleaire). 1984. NTIS (US Sales Only), PC A10/MF A01. File Number DE85780947. (CONF-840166—).

From 12. international workshop on gross properties of nuclei and nuclear excitations; Hirschegg, Austria (16 Jan 1984).

Heavy ion beams up to 1.15 GeV/amu should soon be available at the Saturne II facility. In this prospect a small time projection chamber has been built which allows to reconstruct all the light charged particles (π, p, d, ...) tracks for large multiplicity events (approx.=40). As a first test of the experimental set up, some data taking has already started with 4He-beams at 400, 600 and 800 MeV/amu.

40063 (INIS-mf—9482, pp 29) **Shape discrimination of neutron and gamma response of organic liquid scintillators.** Gerndt, J. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia). Fakulta Jaderna a Fysikalne Inzenyrska). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

40064 (INIS-mf—9482, pp 34) **Optimization of aqueous sample composition for measurement with liquid scintillator detectors.** Heppnerova, M.; Plch, J. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

40065 (INIS-mf—9482, pp 107) **Contamination monitors with proportional counters.** Slezak, V.; Novakova, O.; Fronka, O.; Kos, J.; Smola, J. (Tesla, Premysleni (Czechoslovakia). Vyzkumny Ustav Pristroju Jaderne Techniky). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).
From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).
Published in summary form only.

40066 (INIS-mf—9632, pp 8) **Time resolution measurement of a BaF_2-microchannel plate detector.** Vries, J. de; Eijk, C.W.E. van (Technische Hogeschool Delft (Netherlands)). 19 Oct 1984. NTIS (US Sales Only), PC A02/MF A01. File Number DE85780923. (CONF-8410253—Summ.).
From Autumn meeting of the Dutch Association of Physics; Petten, Netherlands (19 Oct 1984).
Published in summary form only.

40067 (INIS-mf—9645) **Proceedings.** Kuster, J.E.; Batz, H.W.; Craig, D.A. (eds.). (Microscopical Society of Canada, Toronto, Ontario). 1982. 77p. (CONF-8206275—). NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446.
From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).
Conference summaries only.
Papers presented at this conference covered the use of scanning, transmission, high voltage and Auger electron microscopy in medicine, biology, materials science and metallurgy.

40068 (INIS-mf—9645, pp 2-3) **Biological HVEM. So far and what next.** Pawley, J.B. (Wisconsin Univ., Madison (USA)). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).
From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).
Summary.

40069 (INIS-mf—9645, pp 4-5) **X-ray microscopy with a scanning electron microscope.** Fletcher, S.; Hannah, R.S. (Calgary Univ., Alberta (Canada). Dept. of Anatomy). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).
From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).
Summary.

40070 (INIS-mf—9645, pp 6) **Recent advances in scanning electron microscopy.** Lyman, C.E. (Du Pont de Nemours (E.I.) and Co., Wilmington, DE (USA)). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).
From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).
Abstract.

40071 (INIS-mf—9646) **Proceedings.** Parsons, J.R. (ed.). (Microscopical Society of Canada, Toronto, Ontario). 1983. 81p. (CONF-8305262—Summ.). NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447.
From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).
Conference summaries only.
Papers presented at this conference discussed computer applications in electron microscopy and electron diffraction and the use of electron microscopy in biology, medicine and materials science.

40072 (INIS-mf—9646, pp 60-61) **Electron microscopy of colloids.** Hoelke, C.W. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).
From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).
Summary.

40073 (INIS-mf—9646, pp 6-7) **Computer analysis of electron diffraction patterns.** Ploc, R.A. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).
From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).
Summary.

40074 (INIS-mf—9655, pp 49) **Development of a tandem accelerator mass spectrometer at INS.** Wallace, G.; Sparks, R.J.; Pohl, K.P.; Coote, G.E. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). 1983. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441. (CONF-830288—Absts.).
From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).
Abstract only.

40075 (INIS-mf—9703) **Control organization in data storage systems for nuclear physics.** Caprini, M. (Institutul de Fizica si Inginerie Nucleara, Bucharest (Romania)). 1982. 25p. (In Romanian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781406.
Thesis (D.S.).
This thesis is dealing with the study of the general organization methods of the control in data storage systems for experimental data and with the presentation of author's contribution to command blocks and programs for such systems. We emphasize control problems in modular systems for experimental data storage, taking into account both the systems equipped with specialized processes and those equipped with computers or microprocessors. We present the design methods of command blocks for specialized installations and the solutions adopted for two types of installations: control block of a synchronous battery assigned to improve siqnal-noise ratio within electronic paramagnetic resonance spectra and modular micro-coded programer of a system for taking over the data from uncorrelated inputs in neutron physics experiments. We also study the organization and command way of data storage and processing modular systems. Methods for functional units interconnection, structure of base lines, and problems proper to configurations of distributed contro are investigated. Next, we present the solutions adopted in order to make up some command units for CAMAC standard systems. In this respect, we describe a fast CAMAC processor and a modular command unit with microprocessor and CAMAC computer interfaces, assigned to DEC PDP 11, FELIX M18 and FELIX MC8 computers. We review the methods used in CAMAC programing, the author's programs to command the installations directed by the control units mentioned above. These programs have been written in many programing languages (ASSEMBLER, IML, CAMAC subroutines which may be called in FORTRAN and BASIC) and have been used in various fields (configurations and interfaces testing, programs developing, command of some concrete installations).

40076 (INIS-SU—282, pp 512) **Selective discrimination of alkali element radioactive isotopes from a Th target on the YaSNAPP mass-separator.** Avdeev, S.P.; Karnaukhov, V.A.; Korovin, G.Yu.; Kuznetsov, V.D.; Novgorodov, A.F.; Petrov, L.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40077 (INIS-SU—282, pp 520) **Converter for weak magnetic field measuring by NMR method.** Zhernovoj, A.I.; Mel'nikov, N.M. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40078 **(ITEF—79(1983)) Experimental testing of nonadiabatic spin flipper for wide neutron beams.** Bulgakov, M.I.; Gul'ko, A.D.; Trostin, S.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1983. 17p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781303.

Experimental results of flipping efficiency for neutron spin flipper consisting of the current foil with two additional conductors with currents along edges of foil are presented. This current system creates on the opposite surfaces of non-adiabatic region spin flipper only the magnetic field components which are parallel to these surfaces and antiparallel one to another. This fact leads to high reversal efficiency of neutron polarization on the large area of flipper. The facts discussed that, when the polarized neutron beam goes through the spin flipper with reversal efficiency less than 1, the polarization component perpendicular to the guide field appears. The influence of this perpendicular polarization component on the P-odd effects measured with polarized neutrons is considered. 4 references, 5 figures.

40079 **(JINR—13-84-227) Spectrometric amplifiers.** Akimov, Yu.K.; Din' Shi Kh'en; Kalinin, A.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701662.

Submitted to the journal Instrum. Exp. Tech. .

A spectrometric amplifier in CAMAC standard (2M) is described. Its linear part comprises operational amplifiers K544UD2. The circuits contain two baseline restorers which provide high loads up to 10^5 pulse/s. RMS noise voltage reffered to input is less than 10 μV. The unit contains a logical part for generating: "Pulse number", "Dead time" and "Pileup" signals brought out to a front panel.

40080 **(JINR—13-84-566) Automatic search-lock-track circuit of a nuclear magnetometer.** Ivashkevich, S.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781310.

An automatic search-lock-track circuit of a nuclear magnetometer is described. The peculiarity of this circuit consists in that it is provided with automatic control of the coefficient of amplification of the automatic frequency tuning circuit of the RF field. As a result the performance of the magnetometer is improved. The characteristics of the circuit as well as of the magnetometer, using this circuit, are presented. 3 references, 4 figures.

40081 **(JINR—13-84-576) Magnetometer for the magnet measurement complex at the JINR phasotron.** Vasilevskaya, D.P.; Kalinichenko, V.V.; Kuznetsova, M.S. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781311.

A Hall effect magnetometer is described. The device has three Hall converters. The block-diagram of the device is given, the design of thermostatic probes is described, and the basic circuit of the current stabilizer and diagrams of thermostats are given. The magnetometers of the magnetic measurement complex at the JINR phasotron operates in the 1-2 T magnetic field range, the root-mean-square error being +-0.02%. 3 references, 4 figures.

40082 **(JINR—D-3-84-196) To calculation of a neutron adiabatic spin-flipper.** Lushchikov, V.I.; Taran, Yu.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1984. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781304.

The theoretical treatment of the neutron spin-flipper based on adiabatic passage through magnetic resonance is carried out. An equation for spin motion of a neutron with constant adiabatic parameter has been analytically solved and the relation of this parameter with flipping efficiency has been determined. Numerical calculations for the magnetic fields of different forms have been performed, and quantitative estimations of the adiabatic parameter for spin rotation to 90 deg and 180 deg are presented. 5 references, 1 figure.

40083 (JINR—D-13-84-53, pp 298-303) **Data acquisition and processing system of energy dispersive X-ray spectrometer with microprocessor.** Horkay, G.; Kis-Varga, M.; Lakatos, T.; Molnar, J.; Zsurzs, M. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

For quantitative analysis of chemical elements by the method of X-ray spectroscopy a multichannel analyzer on the base of minicomputer with the INTEL 8080 A microprocessor is developed. The data acquisition and data processing systems which comprise a central processor, memory unit, ADC and display are described. Major system subprograms are enumerated. An example of Pb concentration determinating in a bronze specimen is given.

40084 (JINR—D-13-84-53, pp 345-349) **On-line control system for the LIDIA-M mass spectrometer.** Bogdanov, D.D.; Orlova, O.A.; Portie, R.; Rodin, A.M.; Timakov, V.A.; Ter-Akop'yan, G.M.; Chelnokov, L.P. 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

Block-diagram is given and the structure of the LIDIA-M developed mass spectrometer with designed sensitivity of 1 atom per 10^{12}-^{14} atoms of the basis is briefly described. Spectrometer control and data read-out are computerized on the base of the "ELECTRONICA-60" and CAMAC electronic units. The computerized system permits to accelerate data acquisition. The time for one mass spectrum measuring in the 10-200 mass number range constitutes 20 min, relative accuracy of concentration is +-5%. The system ensures data selection and preliminary processing as well as data array output onto the external carrier.

40085 (JINR—D-13-84-53, pp 109-112) **New method of constant fraction timing.** Gal, J.; Bibok, G. 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The method of shaping the signal when the signal passing through the differential amplifier and integrator acquires bipolar form is reported. The signal receivable by a comparator is biased to zero level according to the signal-to-noise ratio. The signal wandering in the 100 ns range at a time constant of 50 ns constitutes less than 2 ns.

40086 (JINR—D-13-84-53, pp 328-330) **Computerized calorimeter system based on the ELECTRONICA-60 microcomputer.** Khodov, S.M.; Aldoshin, A.S.; Tsitovich, A.P. (Inst. Atomnoj Ehnergii, Moscow, USSR). 1984. (In Russian). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

The computerized system for calorimetric measurements of the sample heat capacity operating in the 4-100 K temperature range by the pulse heating method is described. The superconducting sample in the calorimeter is subjected by a consecutive series of heatings (100-150) in the interval of which the temperature smoothy drifts. Measuring the drift temperature and sample heating rate during the pulse one can determine its heat capacity. The system is realized on the ELECTRONICA-60 microcomputer base, the equipment - in the CAMAC standard.

40087 (JINR—D-13-84-53, pp 331-334) **Automatic apparatus for measuring thermophysical quantities controlled by calculator EMG 666.** Kubicar, L.; Illekova, E. 1984. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781324. (CONF-8309239—).

From 11. international symposium on nuclear electronics; Bratislava, Czechoslovakia (13 Sep 1983).

Automatic system for measuring thermal diffusivity, thermal conductivity and heat capacity of samples is described. Measurements are performed by the pulse method in the temperature range from -150 to 1500 deg C. The measuring CAMAC equipment connected with the EMG 666 computer. Data processing is carried out by 100-400 measurement points (measuring cycle) for the whole temperature range.

40088 (JINR—R-13-84-294) **LIDIA high-sensitivity mass spectrometer.** Ter-Akop'yan, G.M.; Arzumanyan, G.M.; Bogdanov, D.D. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781328.

Submitted to the journal NIM.

The design of the "LIDIA" high-sensitivity mass spectrometer for identification of a hypothetical nuclide with 110-114 nuclear charge is suggested. The mass-spectrometer comprises a laser ion source on the base of aluminium-yttrium garnet laser. A ion beam passes from the source through a vapour or a gas target and an electrostatic condenser, then it is focused on a diaphragm. Thus, selection of three-charge ions and their charge exchange occurs to form single-charge ions. A ion-optical system comprising quadrupole lenses and dipole magnets is used for mass-separation of ions. The vacuum system ensures 10^{-6} Pa vacuum in the entire volume of the installation past the diaphragm in the chamber 15 m long and 15 cm in diameter. Microchannel plates are utilized for nuclide detection. 10^{15} ions/h can be detected at the frequency of the laser equal to 30 Hz. The substance flow rate in this case makes up $2x10^{20}$ atoms or 70 mg when converted to Pb. If concentration of the searched for substance equals 10^{-14} at/at then 10 ions of a superheavy element would be detected.

40089 (JINR—R-18-84-404) **High-resistance low-noise resistor for spectrometers with a cooled semiconductor detector.** Baldin, S.A.; Ryakhovskaya, T.I.; Zhargal, Ch.; Zorin, G.N.; Laskus, T.; Osipenko, B.P.; Revenko, A.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701661.

Submitted to the journal Instrum. Exp. Tech. .

High-resistance 10-50 GΩ low-noise resistors for preamplifiers of spectrometers with cooled semiconductor detectors are designed and tested. The noise level of these resistors is four times lower than that of serial KVM type resistors.

40090 (LA-UR—85-1999) **Comparison of four methods of interferogram reduction and interpretation.** Woodfin, G.; Feind, M. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 8p. (CONF-850345—27). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014127.

From Southwest conference on optics; Albuquerque, NM, USA (4 Mar 1985).

This paper will address the problem of accurate reduction and interpretation of interferograms. Peak-to-valley wavefront deformation will be the main criterion of evaluation. Interferograms containing power, spherical aberration, coma, and astigmatism will be evaluated using four different methods. These methods will be (1) visual interpretation using a "harp," (2) manual interpretation, (3) automatic digitization (Zygo Zapp), and (4) computer interpretation (fringe). The strengths and weaknesses of these methods, including cost, time, accuracy, and repeatability, will be discussed. Reference will be made to "Optical Interferograms-Reduction and Interpretation" an ASTM publication. 2 refs., 5 figs.

40091 (LA-UR—85-2362) **Novel instrument for high-pressure research at ultra-high temperatures.** Schiferl, D.; Katz, A.I.; Mills, R.L.; Schmidt, L.C.; Vanderborgh, C.; Skelton, E.F.; Elam, W.T.; Webb, A.W.; Qadri, S.B.; Schaefer, M. (Los Alamos National Lab., NM (USA); Naval Research Lab., Washington, DC (USA); Sachs/Freeman Associates, Inc., Bowie, MD (USA); Carnegie Institution of Washington, DC (USA). Geophysical Lab.). 1985. Contract W-7405-ENG-36. 8p. (CONF-850759—9). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015674.

From 10. high pressure conference on research in high pressure science and technology; Amsterdam, Netherlands (8 Jul 1985).

A resistively heated diamond-anvil cell has been used to achieve pressures of 110 kbar at temperatures exceeding 1200°C for periods long enough to collect x-ray powder diffraction data with energy-dispersive techniques using "white" x-radiation produced at the Stanford Synchrotron Radiation Laboratory. 9 refs., 1 fig.

40092 (LA-UR—85-2579) **Recent developments in Microshell-tipped optical fibers as high-pressure shock detectors.** Mayer, F.J.; Maynard, R.L.; Musinski, D.L.; Schmerberg, N.W.; Wixom, M.R.; Benjamin, R.F. (KMS Fusion, Inc., Ann Arbor, MI (USA); Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 7p. (CONF-850736—48). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015750.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

We describe ongoing development and characterization of Microshell-tipped optical fibers used as impact sensors. We observed a risetime of 15 ns when the probe is used to measure a detonation wave in PETN. We report successful development of two nondestructive tests, radiography and fluorescence, to check the integrity of the sensor. The sensor is now commercially available. 5 refs., 3 figs.

40093 (NBSIR—85-3131) **Laboratory design and test procedures for quantitative evaluation of infrared sensors to assess thermal anomalies.** Chang, Y.M.; Grot, R.A.; Wood, J.T. (National Bureau of Standards, Washington, DC (USA). Center for Building Technology; DCS Corp., Alexandria, VA (USA)). Jun 1985. Contract AI01-76PR06010. 85p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85015257.

This report presents the description of the laboratory apparatus and preliminary results of the quantitative evaluation of three high-resolution and two low-resolution infrared imaging systems. These systems which are commonly used for building diagnostics are tested under various background temperatures (from -20°C to 25°C) for their minimum resolvable temperature differences (MRTD) at spatial frequencies from 0.03 to 0.25 cycles per milliradian. The calibration curves of absolute and differential temperature measurements are obtained for three systems. The signal transfer function and line spread function at ambient temperature of another three systems are also measured. Comparisons of the dependence of the MRTD on background temperatures from the measured data with the predicted values given in ASHRAE Standards 101-83 are also included. The dependence of background temperatures for absolute temperature measurements are presented, as well as comparison of measured data and data given by the manufacturer. Horizontal on-axis magnification factors of the geometric transfer function of two systems are also established to calibrate the horizontal axis for the measured line spread function to obtain the modulation transfer function. The variation of the uniformity for horizontal display of these two sensors are also observed. Included are detailed descriptions of laboratory design, equipment setup, and evaluation procedures of each test. 10 refs., 38 figs., 12 tabs.

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40094 **(SAND—85-0356C) Calibrated Faraday current and magnetic field sensor.** Neyer, B.T.; Chang, J.; Ruggles, L.E. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 7p. (CONF-850887—12). NTIS, PC A02. File Number DE85015507.

From SPIE international technical symposium on optical and electro-optical engineers; San Diego, CA, USA (18 Aug 1985).

We have developed a calibrated optical fiber Faraday rotation current sensor. A strong magnetic field in an optical fiber introduces circular birefringence, causing the plane of polarization of light to rotate by amount proportional to the magnetic field. Faraday loops used in the past were nonlinear due to the stress-induced linear birefringence caused by bending the loop. This linear birefringence interfered with the Faraday rotation, yielding a complicated relationship between the current and detected light signal. We have found a way to overcome the effects of the unwanted linear birefringence and produce a calibrated current waveform. The calibration is limited only by the accurate knowledge of the Verdet constant of the optical fiber. Results of recent experiments, as well as planned measurements will be presented. 5 refs., 3 figs.

40095 **(SAND—85-0415C) Studies of the Bauer piezoelectric polymer gauge (PVF_2) under impact loading.** Lee, L.M.; Williams, W.D.; Graham, R.A.; Bauer, F. (Sandia National Labs., Albuquerque, NM (USA); Ktech Corp., Albuquerque, NM (USA); Institut Franco-Allemand de Recherches de Saint-Louis, 68 (France)). 1985. Contract AC04-76DP00789. 11p. (CONF-850736—34). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014707.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

A cooperative program has been initiated among our laboratories to provide a highly reproducible PVF_2 polymer film for widespread use as a gauge under shock-compression loading. The material source and electrical treatment are based on prior work of Bauer but new, independent studies of gauge response are being carried out. First measurements indicate excellent agreement between the independent studies.

40096 **(UCRL—91872) X-ray diffraction cell for Debye-Scherrer and Guinier (Huber) cameras at pressure and temperature.** Lakner, J.F. (Lawrence Livermore National Lab., CA (USA)). 25 Jun 1985. Contract W-7405-ENG-48. 12p. (CONF-850759—7). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014815.

From 10. high pressure conference on research in high pressure science and technology; Amsterdam, Netherlands (8 Jul 1985).

A gas high-pressure cell for x-ray diffraction studies was developed. It is capable of 2700 atm hydrogen pressure at ambient temperature, when used in a Debye-Scherrer camera, and 1020 atm to at least 300°C, when used in a Guinier (Huber) camera. It is suitable for weakly scattering materials. 4 refs., 5 figs.

40097 **(Y—2343) Precision ion vacuum gage with logarithmic response.** Duncan, M.G. (Oak Ridge Y-12 Plant, TN (USA)). 28 Jun 1985. Contract AC05-84OS21400. 81p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85015312.

A new ion vacuum gage controller has been developed for use with Bayard-Alpert gage tubes. The instrument employs a logarithmic-gain electrometer to cover up to 12 decades of pressure without the gain range changing. Instrument error and repeatability is +-1% of the pressure reading over a 9-decade pressure range with an ideal Bayard-Alpert gage tube. The instrument also offers selectable autoranging of fixed emission-current control. Futhermore, protection circuits and a computer interface are provided.

40098 **Microwave interferometer for shock wave, detonation, and material motion measurements.** McCall, G.H.; Bongianni, W.L.; Miranda, G.A. (Los Alamos National Laboratory, University of California, Los Alamos, New Mexico 87545). *Review of Scientific Instruments;* **56**: No. 8, 1612-1618(Aug 1985).

A microwave interferometer system which provides a continuous measurement of the position of interfaces, such as shock fronts, detonation fronts, or material surfaces, has been developed. The use of low-mass microcoaxial cable, some of which is commercially available, and stripline for conducting the microwave signal into the interior of an experiment makes the perturbation of the measuring system on the experiment small. Other microwave systems have measured the time of peak amplitude of a reflected signal, but the present system with proper matching produces a continuous record of position as a function of time. It is believed that this technique can be used to replace most uses of electrical contact or fiber-optic pins in high-explosive experiments. The amount of data far exceeds that which it is possible to obtain from pins or optical fibers. The matching of the microcoax to the microwave generator has an important effect on the accuracy of the technique. The effect of matching on accuracy will be described in detail, and matching methods will be discussed. A position accuracy of 0.2 mm has been attained. Several methods for extracting position information as a function of time are possible. These techniques are discussed, and their application to the analysis of an experiment is demonstrated. The data from the interferometer system is compared to a streak camera record in a phased, shock-breakout experiment. Agreement is quite good, and the superiority of this method over the pin method is demonstrated by comparing details of the streak and interferometer records.

40099 **Symmetry-restricted profiles for maximizing the output diffraction efficiencies of zone plates in the soft-x-ray range.** Tatchyn, R.; Csonka, P.L.; Lindau, I. (Stanford Synchrotron Radiation Laboratory, Stanford University, Stanford, California 94305). *Journal of the Optical Society of America B: Optical Physics;* **2**: No. 8, 1287-1293(Aug 1985).

A zone-plate transfer function of importance in practical optical systems is the output efficiency, I/sup(1)/I/sub OUT/, where I/sup(1) is the total power diffracted into the first order by the zone plate. We apply variational analysis to derive a special symmetry-restricted zone-plate profile that maximizes this output efficiency. Our solution,, which we have named the generalized symmetry-restricted output efficiency maximizing zone plate, is demonstrably the optimum such symmetry-restricted solution for materials of arbitrary indices of refraction n[n = (1-δ)+ik], where k is the absorption constant and δ is the phase-difference constant. For purely absorbing materials, i.e., for δ = 0, we show that a simple extension of our general solution in the far field leads to the well-known, but less-efficient, Gabor zone plate, which also has the desirable property of suppressing all diffracted orders higher than the first and minus first. Our theoretical solution, which is optimum in both the near and far fields, is of importance for research in the soft-x-ray range, where most materials are in fact both absorbers and phase shifters, i.e., where neither k nor δis evanescent.

40100 **Argon arc lamps.** Barnes, N.P.; Remelius, D.K. (University of California Los Alamos National Laboratory, Chemistry Division, P.O. Box 1663, Los Alamos, New Mexico 87545.). *Applied Optics;* **24**: No. 13, 1947-1949(1 Jul 1985).

The spectra of several Ar arc lamps were measured in the 0.4—0.9-μm range. The voltage and current characteristics of these lamps filled with various Ar pressures were also measured. One of the lamps was then used to pump a Nd-YAG laser, and the same laser was also pumped with a common Xe arc lamp. A comparison of the laser performance with both arc lamps is presented.

40101 **Digital extraction of interference fringe contours.** Mastin, G.A.; Ghiglia, D.C. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Applied Optics;* **24**: No. 12, 1727-1728(15 Jun 1985). Contract AC04-76DP00789.

Two basic techniques for extracting interferogram contours have been discussed. The first is a global contour extracton technique based on the fast Fourier transform. The second extracts individual contours with a thinning algorithm using logical neighborhood transformations. (AIP)

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

REFER ALSO TO CITATION(S) 39695

40102 **(LA-UR—85-2311) Multimaterial arbitrary Lagrangian Eulerian code MMALE and its application to some problems of penetration and impact.** Luttwak, G.; Rabie, R.L. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 6p. (CONF-850736—46). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015686.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

In this work, the Lagrangian-Eularian code MMALE was applied to numerically simulate the penetration of a high speed copper jet into a metal-explosive-metal sandwich. The numerical simulation of the reactive flow induced in the explosive uses the Forest Fire model. Both normal and 45° oblique impact were considered. 13 refs., 3 figs. (ATT)

40103 **(SAND—85-0334C) Shock-induced temperature distributions in powder compact recovery fixtures.** Graham, R.A.; Webb, D.M. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 7p. (CONF-850736—28). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015139.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

Sandia "Bear" and "Bertha" powder compact recovery fixture systems for explosive loading have been widely used to preserve powder compact samples for post-shock analysis. Shock conditions within the compacts are determined from an extensive program of numerical simulation which reveals that, even though the initial loading is planar, the sample conditions are controlled by a radial-mode compression. The wave-trapping phenomenon which occurs in the powder samples leads to relatively uniform shock-induced temperatures except for a very hot area in the outer edge region of some fixtures. 21 refs., 2 figs., 1 tab.

40104 **(SAND—85-0497C) Dynamic and static compressibility of porous granular hexanitrostilbene.** Setchell, R.E.; Taylor, P.A. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 9p. (CONF-850736—35). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015153.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

Hexanitrostilbene (HNS) is a binderless, granular explosive prepared over wide ranges of initial grain size and final bulk density. During shock initiation of HNS, ignition initially occurs at discrete hot spots formed during the dynamic compaction of the porous material. In order to develop a predictive understanding of the shock initiation mechanisms occurring in this explosive, it is necessary to formulate constitutive relations modeling the mechnical response of HNS materials under compressive loading. Our recent studies have established that the shock sensitivity of HNS samples pressed to a common density depends critically on the initial grain size distribution of the material. In the present study, we have undertaken both experimental and analytical studies of the compressibility behavior of HNS under non-reactive conditions. In particular, we have examined the compressibility of HNS materials having a range of initial grain size distributions. 8 refs., 4 figs.

40105 **(SAND—85-1363C) Measurements and calculations of shock propagation in dry desert alluvium.** Bass, R.C. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 6p. (CONF-850736—12). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013949.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

A recent underground nuclear detonation in alluvium utilized a large diameter device emplacement hole and the entire instrumentation array was installed in the backfill material. No significant spall or surface reflections were noted in the data obtained in this large cased hole and the shock structure was clearly detailed to locations close to the surface. Several smaller conventional high explosive detonations located closer to the surface have also been studied in detail. In these instances several satellite instrumentation holes were available and measurements were made at or near the detonation horizon minimizing surface effects. Data from two explosive detonations and the data from the nuclear detonation are compared with computer code calculations made to describe underground explosions in alluvium. Supportive data from a plane wave surface detonation are also discussed. Good agreement between the data and the calculation of hydrodynamic shock propagation in dry desert alluvium was observed. The use of the hydrodynamic model appears valid as long as the velocity of the plastic wave is greater than the speed of sound in air. Beyond this point, at pressures of less than 0.4 kilobars, a constant propagation velocity is observed. This seems to indicate that the air contained in this weak porous material is the factor controlling shock propagation. The porosity of the dry alluvium in the four explosions studied was approximately 40%. We have not yet developed a satisfactory physical model for the effects noted. 5 refs., 4 figs.

40106 **(UCRL—91460) Dynamics of shock-induced energy flux in molecular bonds.** Karo, A.M.; Mehlman, M.H.; Hardy, J.R. (Lawrence Livermore National Lab., CA (USA); Nebraska Univ., Lincoln (USA). Behlen Lab. of Physics). Jul 1985. Contract W-7405-ENG-48. 7p. (CONF-850706—27). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015082.

From 8. international symposium on detonation; Albuquerque, NM, USA (15 Jul 1985).

Over the past ten years we have made many computer studies of shock propagation in condensed media. These studies employed the techniques of computer molecular dynamics (CMD), based on computer solutions of the classical equations of motion for the individual atoms in the condensed media. Recently, we have begun to re-evaluate the information obtained in order to achieve a flexible compromise between "brute force" averaging and continual monitoring of the detailed motion of the individual atoms. The method we have chosen is Fourier analysis in the temporal domain of the motions of groups of atoms which can be preselected. Here, we present an analysis of our early canonical studies and of new data on disordered systems. The present work also utilizes our current codes which contain "neighborhood look-up" procedures designed to examine the system at regular intervals and to determine which bonds should be retained, removed, or added as the system rearranges under shock loading. 7 refs., 9 figs.

40107 **(UCRL—91484) Modeling short pulse duration shock initiation of solid explosives.** Tarver, C.M.; Hallquist, J.O.; Erickson, L.M. (Lawrence Livermore National Lab., CA (USA)). 27 Jun 1985. Contract W-7405-ENG-48. 11p. (CONF-850706—25). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014803.

From 8. international symposium on detonation; Albuquerque, NM, USA (15 Jul 1985).

The chemical reaction rate law in the ignition and growth model of shock initiation and detonation of solid explosives is modified so that the model can accurately simulate short pulse duration shock initiation. The reaction rate law contains three terms to model the ignition of hot spots by shock compression, the slow growth of reaction from these isolated hot spots, and the rapid completion of reaction as the hot spots coalesce. Comparisons for PBX 9404 between calculated and experimental records are presented for the electric gun mylar flyer plate system, the minimum priming charge test, embedded manganin pressure and particle velocity gauges, and VISAR particle velocity measurements for a wide variety of input pressures, rise times and pulse durations. The ignition and growth model is now a fully developed phenomenological tool that can be applied with confidence to almost any hazard, vulnerability or explosive performance problem. 27 refs., 16 figs., 2 tabs.

40108 (UCRL—91485) Supra-compression of LX-07, LX-17, PBX-9404, and RX-26-AF and the equations of state of the detonation products. Green, L.; Lee, E.; Mitchell, A.; Tarver, C. (Lawrence Livermore National Lab., CA (USA)). 27 Jun 1985. Contract W-7405-ENG-48. 8p. (CONF-850706—23). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014802.

From 8. international symposium on detonation; Albuquerque, NM, USA (15 Jul 1985).

Shock velocity vs input pressure in the range of 32 to 112 GPa has been measured for LX-07, LX-17, PBX-9404, and RX-26-AF. The average shock velocity for the first 2.8-mm of run was found to be within one percent of that for the run from 2.0 to 4.8-mm. Supra-compressive states of PBX-9404 were reflected to higher pressures by a copper barrier and the velocity in the copper measured. They were also rarefied by a magnesium barrier and the velocity in the magnesium measured. Equations of state derived for the reaction products of these explosives and normalized to accepted C-J pressures do not adequately predict measurements at pressures substantially greater than detonation pressure, normalization to lower than accepted C-J pressures is required to fit the data. The C-J state defined by the supra-compressive experiments appears to be different from the C-J state defined by the usual C-J pressure measurement.

40109 (UCRL—91490) Motion of thin metal walls and the equation of state of detonation products. Lee, E.; Breithaupt, D.; McMillan, C.; Parker, N.; Kury, J.; Tarver, C.; Quirk, W.; Walton, J. (Lawrence Livermore National Lab., CA (USA)). 8 Jul 1985. Contract W-7405-ENG-48. 11p. (CONF-850706—24). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014809.

From 8. international symposium on detonation; Albuquerque, NM, USA (15 Jul 1985).

In this paper we will report high resolution measurements we have made using cylinders and flat plates to determine detonation product behavior. By using thin walled cylinders and thin plates and by utilizing both streak camera and Fabry-Perot velocimeter techniques we can achieve resolution and accuracy much greater than previously attained. As an example we will present results for an explosive formulation, LX-14, containing 95% HMX and 5% polyurethane and compare these experimental results with the results of hydrodynamic calculations carried out with accuracy equivalent to our experiment uncertainty. By using very thin plates and by varying plate thickness we are largely able to derive the explosive behavior independent of the metal properties. The reaction zone in the explosive can be resolved in the acceleration of the thinnest plates. This reaction front behavior is taken into account in the equation of state description. We show that the cylinder test measurements sample the EOS at expansion ratios $V/V_0 > 1$. Thin flat plates aligned in the plane of the detonation front provide detailed information on the higher compression states (V/sub CJ/ < $V/V_0 < 1.3$). Our results generally confirm the results of earlier work with respect to the pressure derivatives. The results require that (partial derivative lnP/partial derivative lnV)/sub S/ increase as the products expand from the C-J state. 9 refs., 13 figs.

40110 (UCRL—91625) High-energy air shock study in a grout pipe. Glenn, H.D.; Keough, D.D.; Kratz, H.R.; Duganne, D.A.; Ruffner, D.J.; Baum, D. (Lawrence Livermore National Lab., CA (USA); SRI International, Menlo Park, CA (USA); Artec Associates, Inc., Hayward, CA (USA); Systems, Science and Software, La Jolla, CA (USA)). Jun 1985. Contract W-7405-ENG-48. 8p. (CONF-850767—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014805.

From 15. international symposium on shock waves and shock tubes; Berkeley, CA, USA (29 Jul 1985).

A modified Voitenko compressor generated a 43 mm/μs air shock in a 20-mm-i.d. 3.0 m. long pipe containing ambient atmospheric air. The first 0.15 m of outlet pipe was constructed of steel and the last 2.85 m of DR-1 grout. Between 0.10- and 2.5-m from the diaphragm the velocity of the shock front attenuated from 43- to 4.5-mm/μs and peak pressure from 2.28- to 0.024 GPa. The rate of wall expansion uniformly decreases and asymptotically approaches an apparent final radius between 60-100 μs behind the shock front. Plasma flow measurements indicated a flow velocity of 27.4 mm/μs and a magnetic Reynolds number >60. Wall expansion was <1 mm at the end of the pipe indicating significant attenuation of the shock front between 2.5 m and 3.0 m. 13 refs., 13 figs., 1 tab.

40111 (UCRL—92080) Computer simulation of the effect of free surface reflection on shock wave propagation in water. Kamegai, M.; Klein, L.S.; Rosenkilde, C.E. (Lawrence Livermore National Lab., CA (USA)). Jul 1985. Contract W-7405-ENG-48. 7p. (CONF-850736—23). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014807.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

A computer simulation is used to study the behavior of a fluid which has been set into motion by a point explosion below a bounding free surface. Of particular interest is the interaction between the incident shock wave and the reflected rarefaction signal which, under certain conditions, can overtake the shock front. Onset criteria for the envelope which separates the region of irregular from that of regular rarefaction, the nonspherical shape of the shock front, and the pulse profile for several depths of burst covering both strong and weak shock interactions with the surface are discussed. 2 refs., 5 figs.

40112 (LA-tr—85-30) Properties of plastic-bonded nitroguanidine. Dong, H.; Tian, Y.; Chen, X.; Meng, F.; Wang, Q. (Los Alamos National Lab., NM (USA); Academia Sinica, Beijing (China)). 1985. Contract W-7405-ENG-36. Translated from Baozha yu Chongji; No. 1, 77-83 (1981). 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015316.

The formulation of bonded nitroguanidine sued in this work is NQ/TNT/PVB 97.5/1/1.5, which is designated as PB-NQ-1. Various properties of PB-NQ-1 have been determined and compared with those Its detonation parameters have been measured with 100-mm-diameter charges, initiated by a plane wave lens and a 100-mm-diameter by 10-mm-thick Comp. B booster. The detonation velocity is 8.159 mm/μs, and the effective C-J detonation pressure is 26.2 GPa at $rho_0 = 1.676$ g/cm^3. The energy of the one-dimensional plate push test is 65% that of PBX 9704. Our experimental data show the performance of nitroguanidine, insensitivity characteristics, and stability under normal temperatures, are comparable to those of TATB. Hence nitroguanidine may be used as a cheaper substitute for the latter. 9 refs., 2 figs., 7 tabs.

40113 (LA-tr—85-31) Type of new Chinese-produced high-speed camera and its utilization in detonation physics experiments. Sang, Y. (Los Alamos National Lab., NM (USA); Academia Sinica, Beijing (China)). 1985. Contract W-7405-ENG-36. Translated from Baozha yu Chongji; No. 2, 113-115 (1981). 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015191.

This paper introduces the technological capability and special features of the new, domestically produced, Type SJZ-15 high-speed rotating mirror scanning camera and its utilization in detonation physics experiments. The camera uses an axial flow gas turbine and a two-stage internal blower for cooling. The turbine and blower use the same group of nozzles. The structure is simple, has good axial balance, and improves the cooling capability of the driving bearing housing. The two ends of the rotating mirror use three elastic bearing supporters. The axial bearings have "O"-type elastic rubber balls, which are automatically centered and absorb vibration very well. The rotating mirror does not use an axial vacuum system, but the picture quality is excellent. The first objective lens is a Fufica type and permits use as a split-range camera. The operation handles are located on the same side of the camera. The operation handles for the rotating mirror and the main objective lens are not as convenient as the micrometer adjustment. Detonation experimental tests, technology evaluations, and actual usage prove the operation is simple and reliable, the quality of optical image formation is excellent, the light strength is appropriate, and it is an instrument of comparatively great potential. 5 figs.

40114 **Improved model of mixtures and its application to predict postdetonation behavior of PETN.** Ree, F.H. (Lawrence Livermore National Lab, CA). *Materials Research Society Symposia Proceedings;* **22**: 163-166(1984). Contract W-7405-ENG-48.

A new statistical mechanical theory of mixtures was developed to compute properties, such as the Chapman-Jouguet point, adiabatic expansion behavior, and overdriven Hugoniot, of explosives. Application of the theory to PETN shows reliability of the theory. 13 references, 1 figure.

4502 Nuclear

REFER ALSO TO CITATION(S) 40105

40115 **(AD—353599/4/XAB) Vertical ionospheric sounding measurements.** Utlaut, W.F.; Gautier, T.N. (National Bureau of Standards, Boulder, CO (USA). Central Radio Propagation Lab.). 28 Aug 1964. 164p. NTIS, PC A08/MF A01.

Report on Operation Dominic Fish Bowl Series, Proj. 6 5c (U).

This report presents data on the ionospheric perturbations resulting from the five 1962 high-altitude nuclear detonations, Star Fish, Check Mate, Blue Gill, King Fish, and Tight Rope, as obtained with sweep-frequency vertical-incidence ionosondes operated at the Islands of Maui, Tern (French Frigate Shoals), Midway, Wake (Star Fish only), Canton, Tutuila (American Samoa), and Tongatapu. The ionosondes at Midway and Tongataupu had a frequency range of 1 to 25 mc. At the other stations the range was 0.25 to 20 mc. The objective was to obtain information on the immediate and delayed effects on the ionosphere, including radiowave absorption and changes in electron density, at various distances and directions from the detonations. Beginning a few minutes before detonation, each ionosonde was operated continuously until about H + 2 hours, when the interval between ionograms was increased to five minutes for several more hours. Otherwise, ionograms were made at 15-minute intervals.

40116 **(AD—890424/5/XAB) Soils survey. Project Officer's report.** Goode, T.B.; Mathews, A.L. (Army Engineer Waterways Experiment Station, Vicksburg, MS (USA)). 17 May 1963. 35p. NTIS, PC A03/MF A01.

Report on Operation Sun Beam Shot Johnie Boy Project 1.11.

A soil survey was conducted in the vicinity of ground zero prior to the Johnie Boy Event to provide data for Program 1 projects on the physical and mineralogical characteristics of the subsurface soils to a depth of 50 feet and to provide holes for the installation of instruments and sand columns to depth of 80 feet. Field and laboratory tests were conducted to determine the water content, gradation, density, and mineralogical compisition of the natural soils and the compaction characteristics of the soil used for backfill around the detonation device.

40117 (JAERI-M—84-010, pp 251-262) **Present status of the reassessment of atomic bomb radiation dosimetry in Hiroshima and Nagasaki.** Kosako, Toshiso (Tokyo Univ. (Japan). Research Center for Nuclear Science and Technology). Mar 1984. (In Japanese). JAERI-Tokai-Mura, Naka-gun, Ibaraki-ken, 319-11, Japan. File Number TI84901547. (CONF-8311187—; NEANDC(J)—97/AU; INDC(JPN)—84/G).

From JAERI seminar on nuclear data; Tokai, Japan (30 Nov 1983).

The reassessment of atomic bomb radiation dosimetry in Hiroshima and Nagasaki has been going on by the American committee (chairman; Dr. F. Seitz) and the Japanese committee (chairman; Dr. E. Tajima). Here, the status of these committees is written and some discussions are done about their problems.

4503 Explosion Detection

REFER ALSO TO CITATION(S) 40092

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5001 Basic Studies

40118 **(PB—85-185858/XAB) Development of a chemical kinetic mechanism for the US EPA (Environmental Protection Agency) regional oxidant model. Interim report, August 1982-July 1984.** Whitten, G.Z.; Johnson, R.G.; Killus, J.P. (Systems Applications, Inc., San Rafael, CA (USA)). Apr 1985. 266p. NTIS, PC A12/MF A01.

A new generalized mechanism for use in EPA's Regional Oxidant Model has been developed. The mechanism is based on the carbon-bond concept in which organics are grouped according to the type of carbon bonding that is found in the various classes of organics. The mechanism treats biogenic as well as anthropogenic hydrocarbons. The mechanism was tested against multi-day chamber data collected by the University of California, Riverside and against isoprene/NOx data obtained in the outdoor chamber facility of the University of North Carolina. In addition to a description of the mechanism, guidance is also given on how emission data should be partitioned into the various organic groupings that are used in the mechanism.

40119 **Behavior of turbulence statistics in the convective boundary layer.** Hicks, B.B. (Atmospheric Turbulence and Diffusion Division, NOAA, Oak Ridge, Tennessee 37830). *Journal of Applied Meteorology;* **24**: No. 6, 607-616(Jun 1985).

Velocity variances in the convective boundary layer are examined using data derived in PBL experiments over land (Minnesota) and ocean (the Coral Sea) supported by data from the Kansas study of the surface boundary layer. In the freely convective limit, the data clearly support scaling of σ/sub w/ by the convective velocity w/sub asterisk/ instead of u/sub asterisk/, as is common in modern treatments. The freely convective limit appears to be 0.59 for both σ/sub w//w/sub asterisk/ and σ/sub v//w/sub asterisk/. The available data are compatible with relationships based on additive contributions to total variance by mechanical and buoyant forces. The resulting relations are σ/sub w/ = (1.2u²/sub asterisk/ +0.35w²/sub asterisk/)/sup 1/2/, σ/sub v/ = (3.6u²/sub asterisk/ +0.35w²/sub asterisk/)/sup 1/2/. These relations collapse back to the neutral values derived from the Kansas experiment. Similar analyses for temperature variance are somewhat less revealing; however, the available data indicate that scaling by convective properties alone is quite adequate. Hence, σ/sub T/roughly-equal1.8θ/sub asterisk/, where θ/sub asterisk/ = H/rhoc/sub p/w/sub asterisk/. These relations appear to apply over the bulk of the convective PBL, from z/z/sub i/roughly-equal0.1 to at least z/z/sub i/ = 0.6, but extend downwards to very near the surface in the case of σ/sub v/.

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 38722, 40150, 40154, 40156, 40162, 40182, 40184, 40185, 40307

40120 **(AD-A—153092/2/XAB) Measurement of exhaust emissions from diesel-powered forklifts during operations in ammunition-storage magazines. Final report, 23 July 1984-15 March 1985 on Phase 2.** Ungers, L.J. (Pei Associates, Cincinnati, OH (USA)). Feb 1985. 148p. (PN—3611-2). NTIS, PC A07/MF A01.

Indoor air quality and worker exposures were monitored in Stradley and Igloo-type ammunition magazines during the use of diesel-powered forklifts. Test results indicate that the impact of diesel exhaust on breathing zone exposures and magazine air quality depends largely on the type of operation being performed and the type of magazine being used. Of the two operating scenarios inves-

tigated (i.e., loading/unloading and warehousing), warehousing presents the greater potential risk to the health and safety of Army personnel. Of the two magazines investigated, Igloo-type structures of the size encountered in this study are likely to contribute to a hazardous situation. Breathing zone exposures and magazine air quality data were compared with the OSHA permissible exposure levels and ACGIH (American Conference of Governmental Industrial Hygienists) threshold limit values. Under the operating conditions, ventilation, and temperatures experienced during the test, nitrogen dioxide, nitric oxide, and carbon monoxide may pose a health risk to Army personnel in small structures similar in size and design to the Igloo-type magazines. A performance hierarchy can be suggested from the results of the air monitoring data. The Still-Deutz and Hyster-Isuzu vehicles appear to have out performed the Hyster-Perkins and Baker-Deutz forklifts. Under the conditions tested the Still-Deutz and Hyster-Isuzu did not exceed any of the OSHA permissible exposure limits for the exhaust components measured.

40121 (ANL/EES-TM—283) **"Control-or-retire" strategy for reducing sulfur dioxide emissions from power plants.** Garvey, D.B.; Streets, D.G.; Veselka, T.D. (Argonne National Lab., IL (USA)). Oct 1984. Contract W-31-109-ENG-38. 107p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE85015269.

One approach to reducing emissions from power plants exceeding the 1971 NSPS emission limit of 1.2 lb $SO_2/10^6$ Btu, requiring the phased-in retirement of these units, has been interpreted as allowing utilities the option of either retiring or cleaning up a unit to meet a 1.2 lb $SO_2/10^6$ Btu ceiling. Cleanup is the more likely choice, if one compares estimates of the costs of replacement power (about $1200/kW in 1980 dollars) with the costs of refurbishment ($150-$450/kW); refurbishment costs are less even if they are increased to include a flue-gas desulfurization (FGD) retrofit unit ($200-$300/kW for a medium-sulfur coal). This analysis does not determine which units might be cleaned up and which might be retired under such a program. Rather, it is assumed that plants would prefer to comply with the cleanup provisions, and the analysis becomes one of a novel, age-dependent control program. Three general approaches to the reduction of SO_2 emissions are examined: (1) mandatory ceilings, or caps, on the emission rates of existing units; (2) a regional bubble between new and existing units to achieve a mandatory reduction in emissions; and (3) a combination approach - a regional bubble plus caps on the emission rates of existing units. This analysis calculates the emission reduction potential of each control scenario for four time periods: the near-term (represented by 1995), the long-term (represented by 2020), the year of maximum reduction, and the cumulative reduction for the entire 50-y period. 11 refs., 20 figs., 32 tabs. (ACR)

40122 (CEA-CONF—7383) **Monitoring of the boundary-layer stratification by a scanning Mie lidar during the FOS 83 experiment.** Renaut, D.; Capitini, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Aug 1984. 7p. (CONF-8408147—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE85752294.

From 12. international laser radar conference; Aix-en-Provence, France (13 Aug 1984).

Spatial variations of aerosol vertical stratification have been measured with the scanning LIDAR (CEA) and compared to solar measurements and radiosondage during the FOS-BERRE campaign. These data allowed nocturnal study of inversion layers, these layers being responsible for the high observed pollution levels, on the FOS-BERRE site.

40123 (DOE/EV/10429—T2) **Carbon dioxide in arctic and subarctic regions. Final report.** Gosink, T.; Kelley, J.J. (Alaska Univ., Fairbanks (USA). Geophysical Inst.). Jun 1985. Contract AT06-80EV10429. 218p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE85014054.

This report contains summaries and interpretations of the data collected for carbon dioxide partial pressures in the air and water. Sections have been individually abstracted for inclusion in the data base. (ACR)

40124 (DOE/EV/10429—T2, pp 1-13) **Arctic troposphere carbon dioxide; low altitude aircraft sampling.** Gosink, T.A.; Kelley, J.J. (Univ. of Alaska, Fairbanks). Jun 1985. NTIS, PC A10/MF A01. File Number DE85014054. Contract AT06-80EV10429.

In Carbon dioxide in arctic and subarctic regions. Final report.

This paper presents data from low altitude (<4500 m) aircraft sampling for CO_2 in the arctic atmosphere. The data cover the period from late spring to late summer when environmental changes at the tundra and sea ice are most pronounced. Results of the data analysis show the effect of regional sources and sinks for CO_2 on the lower troposphere. The annual ice and open water zones of the Arctic Ocean covered by the flights transects appear to act as a potential sink for carbon dioxide. 16 refs., 6 figs.

40125 (DOE/EV/10429—T2, pp 16-40) **PCO_2 in surface water and air, Norwegian and Barents Seas - Winter, 1983.** Jun 1985. NTIS, PC A10/MF A01. File Number DE85014054.

In Carbon dioxide in arctic and subarctic regions. Final report.

The report presents on carbon dioxide partial pressures in surface water and air in the Norwegian and Barents Seas during February and March, 1983. 6 figs., 3 tabs. (ACR)

40126 (DOE/EV/10429—T2, pp 57-103) **Carbon dioxide and methane in the atmosphere and surface ocean waters of the Indian Ocean and Antarctic Regions.** Gosink, T.A.; Kelley, J.J. (Univ. of Alaska, Fairbanks). Jun 1985. NTIS, PC A10/MF A01. File Number DE85014054.

In Carbon dioxide in arctic and subarctic regions. Final report.

Carbon dioxide, CO_2, in the atmosphere and surface sea water were measured on four legs of the 1982-83 cruise of the Japanese Icebreaker Fuji. This cruise was undertaken in support of the Japanese Antarctic Station resupply and known as the 24th Japanese Antarctic Research Expedition (JARE). The oceanic area covered on this cruise was from Tokyo to Singapore via the western Pacific Ocean, Indian Ocean and Antarctic coastal waters. Analyses of carbon dioxide and methane were accomplished by flame ionization gas chromatography. The results of these observations show that carbon dioxide concentrations in the air during austral summer 1983 in the South Indian Ocean averaged 340.3 +- 1.8 ppM by volume. The equilibrium concentration of carbon dioxide near surface sea water varied from ~400 to 280 ppM. Oceanic areas where sea surface water carbon dioxide concentrations were depressed well below air concentrations (undersaturation) occurred in the South Indian Ocean. Atmospheric methane varied between 1.50 and 1.75 ppM by volume, with the higher concentrations generally occurring north of the South Indian Ocean. The equilibrium concentration of methane was 1 to 13% supersaturated in equatorial regions and near equilibrium to 3% in the cold polar waters. Methane concentrations in sea surface waters between 50 and 60° south latitude along the cruise transect exhibited concentrations slightly higher than atmospheric concentrations by about 2 to 35. Surface methane concentrations in sea water varied from $\sim 7.5 \times 10^{-5}$ ml l^{-1} in antarctic waters to more than 4.0×10^{-5} ml l^{-1} in tropical waters. 17 refs., 13 figs.

40127 (DOE/EV/10429—T2, pp 131-197) **Sources and sinks of carbon dioxide in the arctic regions.** Gosink, T.A.; Kelley, J.J. (Univ. of Alaska, Fairbanks). Jun 1985. NTIS, PC A10/MF A01. File Number DE85014054.

In Carbon dioxide in arctic and subarctic regions. Final report.

The data base required to adequately ascertain seasonal source and sink strengths in the arctic regions is difficult to obtain. However, there are now a reasonable quantity of data for this polar region to estimate sources and sinks within the Arctic which may contribute significantly to the annual tropospheric CO_2 concentration fluctuation. The sea-ice-air and the sea-air interfaces account for most of the contribution to the sources and sinks for carbon dioxide. Although the arctic and subarctic region is small in extent, it certainly is not impervious and ice sealed. Our estimate, based on historical data and current research, indicates that the Arctic,

which is about 4% of the earth's surface, is an annual net sink for $\sim 10^{15}$ g CO_2 accounting for an equivalent of ~3% of the annual anthropogenic contribution of CO_2 to the troposphere. 53 refs., 2 figs., 4 tabs.

40128 **(DOE/OR/00033—T98) Boundary layer transport of small particles.** McCready, D. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Civil Engineering). Jun 1984. Contract AC05-76OR00033. 224p. NTIS, PC A10/MF A01; GPO Dep. File Number DE85015024.

Thesis.

The transport of small particles across the aerodynamic boundary layer that developed over a smooth, flat, acrylic plate and their subsequent deposition was investigated. The velocity boundary layer over the flat plate was characterized for a wind tunnel mainstream velocity of 2 m/d. Particle deposition was quantified with respect to location on the experimental plate with a microscope. The deposition of 0.8, 0.9, 1.1, and 2.0 micron diameter unit density, polystyrene latex microspheres on to oil-coated, uncoated, upper, and lower surfaces was investigated. Although experimental deposition velocities exhibited run-to-run variation, they were significantly greater than those reported in the literature. A turbulent flow deposition model which included eddy diffusion, Brownian diffusion, inertial, and gravitational deposition mechanisms underestimated the experimental deposition velocities. The experimental plate was nonconductive and could not be electrically grounded. It appears the electrostatic attraction mechanism was responsible for the increased experimental deposition velocities; this mechanism was not included in the deposition model. There was no significant resuspension of 42 micron diameter microspheres deposited to an initially moist experimental plate after 6 hours in the wind tunnel at a mean air velocity of 2 m/s.

40129 **(GKSS—84/E/49) Hydrogen chloride measurements with a DAS lidar in the marine atmosphere.** Heinrich, H.J.; Weitkamp, C.; Michaelis, W. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1984. 10p. (CONF-840810—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE85752202.

From International geoscience and remote sensing symposium; Strasbourg, France (27 Aug 1984).

A differential absorption and scattering lidar is described that allows the measurement of hydrogen chloride with a sensitivity of 300 parts per billion and a range of 2 km. The $P_3(3)$ and $P_3(5)$ lines around 3.6 μm from a deuterium fluoride laser are used as the signal and reference line, respectively. The system has been used for investigations of the diffusion and degradation behavior of HCl from at-sea incineration of organochlorine waste in the marine atmosphere.

40130 **(GKSS—84/E/50) State-of-the-art DAS lidar for SO_2 and NO_2.** Lahmann, W.; Staehr, W.; Weitkamp, C.; Michaelis, W. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1984. 7p. (CONF-840810—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE85752203.

From International geoscience and remote sensing symposium; Strasbourg, France (27 Aug 1984).

A ground-based laser remote sensing system is described that allows the range-resolved detection of sulfur dioxide and nitrogen dioxide. The measurement is based on the differential absorption and scattering (DAS) lidar technique. Both lasers are fired with a fixed time delay of only 50 μs to probe an atmosphere with unchanged optical properties ('frozen atmosphere'). NO_2 is detected with two dye lasers emitting around 450 nm, SO_2 is measured at 300 nm with the frequency-doubled output of two dye lasers. Field measurements in the city of Hamburg, Germany, are presented. First determinations of emission rates of SO_2 from a smokestack agree well with operator data.

40131 (PB—81-236119, pp 24-35) **Regulatory pressures for increased NO/sub x/ control.** Wyzga, R.E. (Electric Power Research Inst., Palo Alto, CA). Aug 1981. NTIS, PC A05/MF A01. File Number TI85901488. (CONF-8010379—Vol.1).

From Joint symposium on stationary combustion NOx control; Denver, CO, USA (6 Oct 1980).

The significance of impending NO/sub x/ regulations upon the electric utility industry in addition to the impact from other new laws upon the choice of an NO/sub x/ control technology is discussed. (PSB)

40132 **(UCRL—92942) Uncertainties in the radiative properties of smoke and their effects on climate assessments.** Luther, F.M. (Lawrence Livermore National Lab., CA (USA)). Jul 1985. Contract W-7405-ENG-48. 13p. (CONF-8408122—6). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015187.

From 4. international conference on nuclear war; Erice, Sicily, Italy (19 Aug 1984).

The sensitivity of the climatic effects of large tropospheric smoke loadings to uncertainties in the physical and radiative properties of the smoke is investigated. The extinction coefficient is shown to be very sensitive to the smoke composition and particle size distribution. The reduction in surface temperature resulting from an initial smoke mass loading of 0.5 gm^{-2} varies by more than a factor of 2 depending upon the index of refraction, particle size distribution, and vertical distribution of the smoke in the troposphere. As the smoke is modified by microphysical processes after injection into the atmosphere, the extinction coefficient for urban smoke may be reduced significantly. 8 refs., 7 figs.

40133 **(USGS-OFR—84-604) Rainfall quality at selected sites in Saudi Arabia.** Handy, A.H.; Tucker, R.A. (Geological Survey, Reston, VA (USA)). 1984. 28p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901775.

The chemical composition of rainfall in Saudi Arabia was studied. Data indicate the pH of rainfall is near neutral or basic, indicating a lack of effect from imported nitric or sulfuric acids. Sodium and chloride from the Red Sea or the Arabian Gulf do not appear to be present in appreciable amounts. Particles of calcium, bicarbonate, or sulfate from local disturbances appear to be more important to the chemical quality of rainfall than ions from greater distances. Dry fallout is similar in concentration to the rainfall samples collected concurrently. 12 refs., 2 figs. (ACR)

40134 **Identification of atmospheric C_2H_2 lines in the 3230-3340 cm^{-1} region of high resolution solar absorption spectra recorded at the National Solar Observatory.** Rinsland, C.P.; Goldman, A.; Stokes, G.M. (NASA Langley Research Center, Atmospheric Sciences Division, Hampton, Virginia 23665). *Applied Optics;* **24**: No. 14, 2044-2046(15 Jul 1985). Contract AC06-76RL01830.

Identification and analysis of selected atmospheric C_2H_2 lines in a representative set of Kitt Peak solar spectra are reported. (AIP)

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 39247, 39342, 39355, 40171, 40890, 40892

40135 (DOE/EV/03382—17, pp IV.1-IV.8) **Environmental radiation exposure of former uranium miners in Marysvale, Utah (preliminary report).** Steinhausler, F.; Cohen, N.; Spitz, H.; Wrenn, M.E. 30 Jun 1978. NTIS, PC A05/MF A01. File Number DE85011808.

In Radioactivity studies. Progress report.

Measurements of the natural radiation environment were carried out in the homes of both former and current uranium miners. The purpose of this exploratory study was to determine the suitability of this community for the planned epidemiological investigation and to obtain preliminary information about the levels of natural radioactivity in the area where the miners and their families have spent the major part of their lives. 3 refs., 1 fig., 1 tab.

40136 **(DOE/NV/10327—19) Radiological effluent and onsite area monitoring report for the Nevada Test Site, January 1984-December 1984.** Fauver, D.N. (Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (USA)). Jul 1985. Contract AC08-84NV10327. 209p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE85015611.

This report documents the environmental surveillance program at the Nevada Test Site from January 1984 through December 1984. The results and evaluations of measurements of radioactivity in air and water, and of direct gamma radiation exposure rates are presented. Relevancy to DOE concentration guides is established. 25 refs., 14 figs., 24 tabs.

40137 **(DOE/OR/00033—T107) Beryllium-7 deposition to terrestrial vegetation in Tennessee.** Mahoney, L.A. (Western Kentucky Univ., Bowling Green (USA); Oak Ridge National Lab., TN (USA)). Apr 1984. Contract AC05-76OR00033. 94p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85015025.

Thesis.

Measurements of natural beryllium-7 (^{7}Be) were made in field vegetation and rainwater at the Department of Energy's Oak Ridge Reservation throughout the months of July 1982 to June 1983. Laboratory experiments were also conducted on the adsorption and desorption of ^{7}Be, cesium-137 (^{137}Cs), lead-210 (^{210}Pb), and iodine-131 (^{131}I) to the foliage of fescue, 3 varieties of beans, and loblolly pine. The field loss of artificially applied ^{7}Be to field fescue was also measured. The weathering half-life (T/sub W/) was found to be 36.5 days during November-January 1982-1983; no difference was found in the loss of ^{7}Be during the months March-May 1983, T/sub W/ = 38.5 days. The loss of sulfur-35 (^{35}S) was studied concurrently with the spring loss of ^{7}Be; the T/sub W/ for ^{35}S was much smaller, equal to 18.4 days. The interception fraction, r, was determined experimentally in the field using the flux of ^{7}Be in rainwater incident upon clover; the mean value was 0.172. Total deposition velocities were estimated using monthly ^{7}Be rainwater concentrations and quarterly air concentrations; the yearly average was 1.66 cm/sec. An equation for predicting vegetation concentrations was derived for ^{7}Be from the US Nuclear Regulatory Commission's Guide 1.109. Generic and site-specific values for deposition rate, interception fraction, effective half-life, exposure time, and biomass density were summarized separately and the derived equation was employed to make predictions of monthly ^{7}Be vegetation concentrations. These predictions were compared to actual field observations. With the exception of the month of May, both generic and site-specific predictions were found to underestimate the actual ^{7}Be vegetation concentrations. 44 refs., 9 figs., 15 tabs.

40138 **(EUR—9213) Physical model of the dispersion of a radioactive contaminant in the atmosphere above a heat island.** Toly, J.A.; Tenchine, D. (Commission of the European Communities, Luxembourg). 1984. 65p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701624.

The project deals with the impact of surface heating in urban areas on the dispersion of contaminants in the atmosphere. The atmospheric boundary layer is simulated in a water flume. Ground heating is applied locally reproducing the heat flux of an urban region. Fission products for which internal heat source is neglected are simulated by horizontal plumes at pHs different from the original pH of the flume. The main results of the study concern: the characterization of the internal boundary layer downstream of the leading edge of the heated ground; the comparison of the concentration distributions of pollutants with and without surface heating. A transposition of the results, expressed in terms of global parameters, enables information on the heat island effect due to urban regions on the dispersion of contaminants in the atmosphere to be obtained.

40139 **(EUR—9385) Sensitivity, applicability and validation of bi-Gaussian off- and on-line models for the evaluation of the consequences of accidental releases in nuclear facilities.** Kretzschmar, J.G.; Mertens, I.; Vanderborght, B. (Commission of the European Communities, Luxembourg). 1984. 177p. NTIS (US Sales Only), PC A09/MF A01. File Number DE85701625.

A computer code CAERS (Computer Aided Emergency Response System) has been developed for the simulation of the short-term concentrations caused by an atmospheric emission. The concentration calculations are based on the bi-Gaussian theorem with the possibility of using twelve different sets of turbulence typing schemes and dispersion parameters or the plume can be simulated with a bi-dimensional puff trajectory model with tri-gaussian diffusion of the puffs. With the puff trajectory model the emission and the wind conditions can be variable in time. Sixteen SF_6 tracer dispersion experiments, with mobile as well as stationary time averaging sampling, have been carried out for the validation of the on-line and off-line models of CAERS. The tracer experiments of this study have shown that the CAERS system, using the bi-gaussian model and the SCK/CEN turbulence typing scheme, can simulate short time concentration levels very well. The variations of the plume under non-steady emission and meteo conditions are well simulated by the puff trajectory model. This leads to the general conclusion that the atmospheric dispersion models of the CAERS system can give a significant contribution to the management and the interpretation of air pollution concentration measurements in emergency situations.

40140 (INIS-mf—9482, pp 100) **Some problems of simultaneous integral determination of specific activity of radon daughters.** Richter, M.; Burian, I.; Cech, J.; Hladka, E.; Svoboda, S. (Ustav Hygieny Prace v Uranovem Prumyslu, Pribram (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

40141 (INIS-mf—9482, pp 4) **Radioactive gas monitoring.** Bedi, E.; Chudy, M.; Janik, R.; Povinec, P. (Komenskeho Univ., Bratislava (Czechoslovakia). Matematicko-Fyzikalna Fakulta). Aug 1983. (In Slovak). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

40142 **(JAERI-M—84-068) Data of very low wind velocity and of air tracer concentration in the diffusion experiments under very stable condition. September 1976-October 1981.** (Japan Atomic Energy Research Inst., Tokyo). May 1984. 131p. (In Japanese). NTIS (US Sales Only), PC A07/MF A01. File Number DE85701626.

The experimental studies on the structure of very low wind velocity for the purpose of estimation of how effluent gases diffuse in the atmosphere were entrusted to The Japan Weather Association. The data which was obtained in these experiments, measured by ultrasonic anemometer and of air tracer concentration under very stable conditions are summarized and described in this report.

40143 **(SCPRI-RM—8-1984) Monthly results of measurements, August 1984.** (Service Central de Protection contre les Rayonnements Ionisants, 78 - Le Vesinet (France)). Sep 1984. 36p. (In French). NTIS (US Sales Only), PC A03/MF A01. File Number DE85751930.

Measurement tables concerning the surveillance of the environment in France (see also the SCPRI-RT--3-1984 report).

40144 **(SCPRI-RM—9-1984) Monthly results of measurements, September 1984.** (Service Central de Protection contre les Rayonnements Ionisants, 78 - Le Vesinet (France)). Oct 1984. 46p. (In French). NTIS (US Sales Only), PC A03/MF A01. File Number DE85751929.

Measurement tables concering the surveillance of the environment in France (see also the SCPRI-RT--3-1984 report).

40145 **(SCPRI-RM—10-1984) Monthly results of measurements, October 1984.** (Service Central de Protection contre les Rayonnements Ionisants, 78 - Le Vesinet (France)). Nov 1984. 35p. (In French). NTIS (US Sales Only), PC A03/MF A01. File Number DE85751928.

Measurement tables concerning the surveillance of the environment in France (see also the SCPRI-RT--3-1984 report).

40146 **(SCPRI-RT—3-1984) 3. Quarterly progress report 1984. [Radiation Monitoring in Environment].** (Service Central de Protection contre les Rayonnements Ionisants, 78 - Le Vesinet (France)). 1984. 39p. (In French). NTIS (US Sales Only), PC A03/MF A01. File Number DE85751927.

This report of the SCPRI exposes an interpretation of the principal results concerning the surveillance of radioactivity in the environment: atmospheric dusts, rainwater, surface water, undergroud water, sewage water, drinking water, food chain, sea water around nuclear plant sites and other sites. The activities of various radioisotopes are presented in tables. This report exposes also the state of surveillance and assistance operations on work sites and the state of incidents along the three months; a bibliographic selection is also presented.

5006 Regulations

REFER ALSO TO CITATION(S) 40200

40147 **(GAO/RCED—85-73) EPA's delegation of responsibilities to prevent significant deterioration of air quality: how is it working.** Bowsher, C.A. (General Accounting Office, Washington, DC (USA). Office of the Comptroller General). 4 Apr 1985. 46p. US General Accounting Office, Box 6015, Gaithersburg, MD 20877. File Number TI85901755.

Report to the Chairman, Subcommittee on Oversight and Investigations, Committee on Energy and Commerce House of Representatives.

The Clean Air Act of 1963, as amended, authorizes the Environmental Protection Agency (EPA) to delegate operational responsibilities for national air pollution prevention and control programs to state and local governments whenever possible. GAO reviewed EPA's delegation of the Prevention of Significant Deterioration Program to six states within three EPA regions and found that EPA had taken steps to ensure that those state agencies had the legal authority, technical capabilities, and resources needed to administer the program before delegating responsibilities to them. GAO also found no significant differences in levels of effort between EPA and those states in carrying out the program activities before and after delegation. GAO noted that the three EPA regions it reviewed had not consistently maintained EPA's Compliance Data System and, as a result, the status of air pollution control program activities may not be current. GAO recommends that the EPA Administrator reevaluate the importance of the system as an oversight tool.

40148 (PB—81-236119, pp 18-23) **Air quality control from a state regulator's viewpoint.** Henry, L.M. Aug 1981. NTIS, PC A05/MF A01. File Number TI85901488. (CONF-8010379—Vol.1).

From Joint symposium on stationary combustion NOx control; Denver, CO, USA (6 Oct 1980).

The state of the air quality in Colorado is assessed with the regulatory inclinations addressed for nitrogen oxides as compared to carbon monoxide, hydrocarbons and sulfur dioxide.

40149 (PB—81-236119, pp 36-54) **Development and revision of air quality standards with special attention to the NO_2 standard review.** Jones, M.H. (Environmental Protection Agency, Research Triangle Park, NC). Aug 1981. NTIS, PC A05/MF A01. File Number TI85901488. (CONF-8010379—Vol.1).

From Joint symposium on stationary combustion NOx control; Denver, CO, USA (6 Oct 1980).

This paper describes the process for review of National Ambient Air Quality Standards. Special attention is given to the issues facing the Environmental Protection Agency in assessing the need for and nature of possible modifications to the NO_2 ambient air quality standards. The legal requirements for the Clean Air Act Amendments of 1977 are discussed as they apply to this review and to the decision process in making a standard choice. The paper describes not only the importance of the scientific basis for selecting a standard but also the role of the policymaker and the judicial process. Criteria document development, the scientific review process, the preliminary staff position paper and the public review process are all described. Finally, the critical elements in the upcoming NO_2 standard decision are identified and discussed.

40150 (PB—81-236119, pp 55-63) **Acid rain issues.** Luken, R.A. (Environmental Protection Agency, Washington, DC). Aug 1981. NTIS, PC A05/MF A01. File Number TI85901488. (CONF-8010379—Vol.1).

From Joint symposium on stationary combustion NOx control; Denver, CO, USA (6 Oct 1980).

The US Environmental Protection Agency (EPA) is concerned about the effects of acid rain because the acidity of precipitation falling on the US, Canada, and Scandinavia has been increasing for the past two decades. An annual average precipitation of pH of 4.0 to 4.5 is not uncommon in the eastern US, southeastern Canada, and western Europe. Acid rain also has become more widespread in the past twenty years. Once confined to urban and industrial areas, the effects of acid rain are now being experienced in places as remote from industry as northern Minnesota and Florida. Although all the consequences of acid deposition are not well understood, a growing body of evidence suggests that acid rain is responsible for substantial adverse environmental effects. These include the acidification of lakes, rivers and groundwaters, injury to aquatic species, acidification and demineralization of soils, reduction of forest productivity, damage to crops, and deterioration of buildings and man-made materials. In addition, the effects of acid rain on metallic elements in soil, aquatic ecosystems, and drinking water systems may affect human health adversely. Current EPA authority generally focuses on control of the groundlevel concentrations of the precursor pollutants of acid rain. Control of these concentrations will not necessarily impact the level of acid rain which is more a function of the total precursors emitted into the air in a region over an extended period of time. In order to reduce SO_2 and NO/sub x/ emissions, EPA in cooperation with the Department of Energy, is evaluating alternative emissions reductions strategies. These strategies focus primarily on utility and industrial boilers.

40151 (PB—81-236119, pp 64-75) **State of California perspective on NO/sub x/ control for stationary sources.** Goodley, A. (California Air Resources Board, Sacramento). Aug 1981. NTIS, PC A05/MF A01. File Number TI85901488. (CONF-8010379—Vol.1).

From Joint symposium on stationary combustion NOx control; Denver, CO, USA (6 Oct 1980).

The California NO/sub x/ control program is directed toward the achievement and maintenance of air quality standards not only for nitrogen dioxide, but also for ozone, total suspended particulate and visibility. In addition to stringent controls on mobile sources, controls on existing stationary sources and best available control technology (BACT) on sources are needed in non-attainment areas. In these non-attainment areas, the state is encouraging local districts to adopt controls on refinery boilers and heaters, industrial boilers, gas turbines, stationary I.C. engines, glass plants and cement plants, in addition to existing controls on power plants. The state considers selective catalytic reduction (SCR) to be BACT for most natural gas and oil fired combustion sources, and that (SCR) will be BACT for coal-fired power plants. We also believe that combustion modification techniques can be improved so that SCR may be unnecessary on some sources.

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

REFER ALSO TO CITATION(S) 38939

40152 **(DOE/OR/00033—T152) Leaf litter disappearance in a tropical montane rain forest.** La Caro, F. (Oak Ridge Associated Universities, Inc., TN (USA)). Mar 1982. Contract AC05-76OR00033. 100p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85015023.

Thesis. Submitted to Univ. of California, Davis.

The time course of leaf litter disappearance of six rain forest tree species was monitored for 32 weeks at the El Verde lower montane rain forest study site in northeastern Puerto Rico. Dacryodes excelsa, Sloanea berteriana and Drypetes glauca were chosen to represent primary climax species while Cecropia peltata, Inga vera and Ixora ferrea were selected to represent the secondary successional species for this forest. The string non-confined tethered leaf method was employed in this study. Dry weights and concentrations of nitrogen, phosphorus, potassium, calcium and magnesium were determined through seven segments of time. Leaf litter fall and standing crop were estimated and general soil characteristics were measured to provide background data. The secondary species Cecropia peltata and Inga vera were found to have slower rates than the primary species Dacryodes excelsa and Sloanea berteriana. The same pattern appeared to emerge between the understory secondary Ixora ferrea and the understory primary Drypetes glauca. The interacting effects of the leaf structural characteristics such as % lignin and % fiber were found to be best correlated with the observed decay rates. Nutrients were considered important in establishing resource quality factors but did not appear to influence decay rates. Instead, nutrient dynamics reflected intervals of element immobilization, mineralization and importation. 82 refs., 13 figs., 12 tabs.

40153 (INIS-mf—9573-Vol.3, pp 463-490) **Calibration of humidity measurement instruments using radioactive sources.** Figueroa Sandoval, B.; Martinez Menez, M.R.; Cuevas Renaud, B. (Colegio de Post-Graduados, Chapingo (Mexico). Secretaria de Agricultura y Recursos Hidraulicos). 1981. (In Spanish). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781444.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Humidity content by volume in the soils of four representative sample soil sites in Mexico was determined from a calibration curve obtained using a neutron moisture meter.

40154 **Threshold velocities for input of soil particles into the air by desert soils.** Gillette, D.A.; Adams, J.; Endo, A.; Smith, D.; Kihl, R. (Univ. of Colorado, Boulder). *Journal of Geophysical Research;* **85**: No. C10, 5621-5630(20 Oct 1980). (CONF-790842—).

From International conference of global atmospheric pollution; Boulder, CO, USA (12 Aug 1979).

Desert soils mostly from the Mojave Desert were tested for threshold friction velocity (the friction velocity above which soil erosion takes place) with an open-bottomed portable wind tunnel. Several geomorphological settings were chosen to be representative of much of the surface of the Mojave Desert, for example, playas, alluvial fans, and aeolian features. Variables which increase threshold velocity are decreasing proportion of sand, increasing size of dry aggregates of the soil, and increasing fraction of the soil mass larger than 1 mm. Threshold velocity increases with different types of soil surfaces in the following order: disturbed soils (except disturbed heavy clay soils), sand dunes, alluvial and aeolian sand deposits, disturbed playa soils, skirts of playas, playa centers, and desert pavement (alluvial deposits). 21 references, 5 figures, 6 tables.

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 40307

40155 **(CONF-850893—1) General solute transport model and its applications in contaminant migration analysis.** Yu, C.; Jester, W.A.; Jarrett, A.R. (Argonne National Lab., IL (USA); Pennsylvania State Univ., University Park (USA)). 1985. Contract W-31-109-ENG-38. 20p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014987.

From Practical applications of ground water models conference; Columbus, OH, USA (19 Aug 1985).

A general solute transport model is developed to simulate solute movement in both homogeneous and nonhomogeneous media. This general model, called Group Transfer Concentration (GTC) model, divides the medium into groups according to the water velocity in each group. Since the water velocity is a function of the hydraulic conductivity of the medium and/or the water content, nonhomogeneity is simulated according to its hydraulic conductivity by dividing the medium into homogeneous subregions. These subregions can be further divided into smaller groups as needed to model dead-end and unsaturated pores. Each group of the GTC model has its own parameters such as dispersion coefficient, retardation factor, and degradation rate. Mass transfer is allowed between every two groups in both the solution and solid phases, and the mass transfer rate is assumed to be proportional to the concentration difference between the two groups. This GTC model can be used for both saturated and unsaturated conditions if the group parameters are appropriately chosen such that the average water content in each group is constant. The GTC model covers the conventional dispersion-advection model, the mobile-immobile pores model, the nonequilibrium adsorption-desorption model, and the jointed porous rock model. A computer program was written to solve the GTC model using the finite-differences method. Experimental breakthrough curves (BTCs) generated by the authors were analyzed using the GTC model. The results showed that the single-group conventional dispersion-advection model can only describe the leading edge of a BTC. The two-group mobile-immobile pores model can be used to predict BTCs under homogeneous saturated conditions. More than two groups are needed to describe BTCs obtained under nonhomogeneous and/or unsaturated conditions. 33 refs., 3 figs., 1 tab.

40156 **(CONF-850943—1) Biogeochemical cycling and distribution of lead in a pine-oak forest in New Jersey.** Turner, R.S. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85013987.

From 5. international conference on heavy metals in the environment; Athens, Greece (10 Sep 1985).

Environmental Sciences Division Publication No. 2555.

Concentrations, fluxes, and amounts of lead (Pb) were measured in incoming precipitation, vegetation, forest floor, acidic sandy mineral soil, and stream discharge in the New Jersey Pine Basrrens (USA). Standing pools and budgets were calculated to determine the sources and sink of this heavy metal in the ecosystem. The relationship of Pb to other chemical parameters was examined to infer the biogeochemical controls on Pb mobility. 11 refs., 3 figs.

40157 **(DOE/CH/10195—1) Landfill gas project: helium soil-gas investigations. Final technical report.** Reimer, G.M.; Been, J.M. (Geological Survey, Denver, CO (USA)). Feb 1985. Contract AI02-84CH10195. 35p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015377.

A series of preliminary helium soil gas surveys at a landfill site in DuPage County, Illinois, were conducted as part of a larger program to investigate the influence of meteorological parameters and, eventually, gas recovery operations on the production, transport, and migration of gases at landfill sites. The first survey determined the overall distribution of helium at the landfill and served as a guide to establish fixed stations for later surveys. The second survey monitored the variation of helium concentrations with time to view the effect of meteorological influences. From the helium data higher concentrations of landfill-produced gases were inferred to be located near the flanks of the landfill. The surface manifestations of gas were very localized, occurring in discrete areas of 100 m^2 or less. Fracture systems, developed by the settling landfill, control the near surface release of the gas and increase the local permeability permitting greater atmospheric dilution of the soil gases than at other areas of the landfill. 5 refs., 2 figs., 3 tabs.

40158 **(DOE/ER—0226) Energy-related solid wastes environmental transport and fate. Geochemical, hydrological and ecological research in the mobilization, environmental transport and long term effects of organic compounds, trace elements and radionuclides from energy residuals.** Francis, C.W.; Turner, R.R.; Davis, E.C.; Wobber, F.J. (Oak Ridge National Lab., TN (USA); USDOE Office of Energy Research, Washington, DC. Ecological Research Div.). Apr 1983. Contract AC05-84OR21400. 141p. NTIS, PC A07/MF A01; GPO Dep. File Number DE85015286.

Environmental Sciences Division Publication No. 2147.

This document summarizes the goals and strategy of a basic research program focused on energy solid wastes. The intent of this document is to develop a plan to structure current and future research needs and to coordinate existing research efforts. 10 figs., 10 tabs.

40159 **(DOE/ER—0227) Subsurface Transport Program. Workshop on research needs: solid wastes from energy producing technologies. Summary report.** Wobber, F.J. (USDOE Office of Energy Research, Washington, DC. Ecological Research Div.). May 1985. 86p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85015285.

The workshop identified specific areas of research that might be needed to resolve scientific uncertainties about disposal of large volumes of energy-related solid wastes in the environment. Research needs were divided into four categories: (1) source terms and generic physicochemical characterization of solid wastes; (1) beneficial utilization of solid wastes; (3) disposal of energy-related solid wastes in landfills; and (4) environmental impacts of solid waste management. (ACR)

40160 **(DOE/ER—0228) Hydrophysical interactions of organic chemicals with geological materials. Research highlights subsurface transport program.** (USDOE Office of Energy Research, Washington, DC. Ecological Research Div.; Pacific Northwest Labs., Richland, WA (USA)). May 1985. 27p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015283.

The current literature on hydrophysical interactions of organic solutes with sedimentary rocks of low permeability was reviewed. The motivation was the premise that low permeability rocks may act as secondary (aquifer) barriers for the containment of hazardous organic wastes, thus preventing these wastes from contaminating the groundwater. However, this premise may be incorrect if organic wastes can affect the hydraulic conductivity of these rocks. The results of this literature search as well as conversations with other researchers in this and related areas indicate that very little work has been done concerning interactions of organics with consolidated subsurface materials. Available information on three related topics was summarized in this report: the effect of organic compounds on the hydrophysical properties of clays, case studies concerning the interactions of organic compounds with clays and sedimentary rocks, and the effect of shales on inorganic transport. These studies give an indication of some research areas that need to be explored with regard to the effect of organic compounds on the hydrophysical properties of sedimentary rocks; these research needs are briefly summarized. 43 refs.

40161 **(DOE/ER/60179—2) Chemical processes in forest soils. Progress report, August 1, 1984-July 1, 1985.** Zelazny, L.W.; Evans, A. Jr.; Riha, S.J.; James, B.R.; Bartlett, R.J.; Magdoff, F.R. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)). Jul 1985. Contract AS05-83ER60179. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015962.

Progress is reported in the following areas: (1) mechanism of aluminum adsorption on clay minerals and peat; (2) mechanism of aluminum adsorption on kaolinite; (3) influenc of sulfate additions from acid precipitation on soil; (4) dissolved organic carbon levels in soil as influenced by acid precipitation; (5) spatial variability of pH and organic matter in forest plantations; (6) soil pH buffering and acidification of forest soils; and (7) determination of aluminum in forest soil leachates.

40162 **(DOE/OR/21400—T157) Integrated forest study on effects of atmospheric deposition. Project summary.** Johnson, D.W.; Lindberg, S.E. (Oak Ridge National Lab., TN (USA)). Jul 1985. Contract AC05-84OR21400. 38p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015972.

The forest effects research is divided into two major sections: atmospheric deposition and forest nutrient dynamics. Atmospheric deposition tasks will provide estimates of the rates of deposition to the canopy by precipitation, dry deposition of vapors and particles, and by cloud and fog interception, and also the wetfall return to the forest floor. The forest nutrient effects tasks will provide estimates of element fluxes in litter and soil systems, estimates of internal H^+ production, and characterization of key processes leading to S, N, and H saturation in soils. The results of these tasks will be combined in assessments of atmospheric deposition effects on forest nutrient cycles, which can in turn be applied to assessments of nutritional causes of forest dieback and long-term effects on productivity.

40163 (IAEA-TECDOC—306, pp 7-16) **Influence of agronomic amendments on the fate of bound methyl parathion residues in soils.** Gerstl, Z.; Helling, C.S. (Pesticide Degradation Lab., Department of Agriculture, Beltsville, MD (USA)). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

The fate of [ring-^{14}C] methyl parathion in a silt loam soil was monitored during a 49-day incubation period. At this point, 54% of the initial ^{14}C remained in the soil; of this, 13% was extractable with MeOH and 87% was bound residue. Soils were then treated with inorganic and organic amendments and incubated an additional 70 days. Release of methyl parathion bound residues could not be demonstrated, but mineralization of both bound and extractable ^{14}C to $^{14}CO_2$ was seen. Slow, continuous production of CO_2, all at comparable rates, occurred with the controls and with amendments H_2SO_4, $(NH_4)_2SO_4$, NH_4OH, chitin, oat seedlings, and oat straw. Glucose and asparagine caused high rates of $^{14}CO_2$ production. $HgCl_2$ gave very high initial rates of $^{14}CO_2$ loss; the rate declined to that of the control only after 9-10 weeks. The lime treatment exceeded the controls after 1 week, declining only slightly with time. The effects of sewage sludge and dairy manure were similar to the controls except that: (a) sludge caused a very high initial loss of $^{14}CO_2$, and (b) both treatments gave an unaccountable loss of ^{14}C, perhaps as $^{14}CH_4$ from anaerobic conditions. By 70 days, levels of extractable ^{14}C and bound ^{14}C had both declined twice as rapidly in certain amended soils as in unamended controls.

40164 (IAEA-TECDOC—306, pp 17-25) **Studies on bound residues of ^{14}C-malathion in soil.** Hussain, A.; Azam, F.; Malik, K.A. (Nuclear Inst. for Agriculture and Biology, Faisalabad (Pakistan)). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

The extractability and formation of bound ^{14}C-labelled residues in clay loam soil under laboratory conditions were investigated with malathion. ^{14}C-malathion rapidly decomposed to $^{14}CO_2$. Twelve days after treatment 56% of the applied dose was lost as $^{14}CO_2$. Methanol gave the highest extraction efficiency; 6% of the applied radiocarbon was extractable while bound residues amounted to 38%. The soil containing ^{14}C-labelled residues was fractionated into humic acid, fulvic acid and humin fractions. These fractions contained 7.83%, 16.81% and 19.36%, respectively of applied radiocarbon.

40165 (IAEA-TECDOC—306, pp 27-36) **Studies of ^{14}C-methamidophos residues and their binding to Costa Rican vegetables and soils.** Carazo, E.; Constenla, M.A.; Fuentes, G. (University of Costa Rica, San Jose); Moza, P.N. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Inst. fuer Oekologische Chemie). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

Studies of ^{14}C-methamidophos residues in tomato, lettuce and two soils were made under greenhouse conditions. Residues in tomato fruits were 4.5 ppm 35 days after the last application. Total residues in lettuce were also high and present mainly in the edible leaves (9.7 and 12.8 ppm after 3 and 5 applications of the insecticide, respectively). The non-extractable residues constituted a significant part of the total residues in plant tissues. Recovery of the

extractable residues decreased with time more rapidly in a loamy clay than in a clay soil. Bound residue levels were about 8% of the applied ^{14}C in loamy clay after 10 days. Residues in the clay soil were higher and continued to decline throughout a 65-day period.

40166 (IAEA-TECDOC—306) Radiotracer studies of bound pesticide residues in soil, plants and food. Report of a research co-ordination meeting on isotopic tracer-aided studies of unextractable or bound pesticide residues in soil, plants and food organized by the Joint FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development and held in Neuherberg, 11-15 July 1983. (Joint FAO/IAEA Div. of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development, Vienna (Austria)). Apr 1984. 189p. (CONF-8307152—). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282.

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

Items within the scope of EDB have been entered individually into the data base. (ACR)

40167 (CE-Trans—8027) Acidifying and neutralizing effects of nitrogen fertilizers on forest soil. Noemmik, H.; Wiklander, G. (Central Electricity Generating Board, London (UK). Translations Section; Statens Natuurvaardsverk, Solna (Sweden)). 8 Oct 1984. Translation of SNV-PM 1657, March 1983. 28p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85901857.

The supply of ammonium nitrate probably results at a number of locations in some acidification of the forest soil which, however, is difficult to detect. A realistic assessment is that the acidification effect of a single-shot fertilizing operation (150 kg N/hectare) corresponds on average to 40 to 60 kg of Ca 0/hectare in increased liming requirements, which in its order of magnitude is comparable with 3 to 4 years of atmospheric acid rainfall in central Sweden. If limestone or dolomite are added to the fertilizer (ammonium calcium nitrate) in the long term an acid-neutralizing effect is achieved. If it is regarded as desirable, in conjunction with a supply of nitrogen, also to neutralize the excess from the acid rainfall, then the amount of added limestone should be increased in the ammonium calcium nitrate currently employed. If the nitrate leaching problem is disregarded, calcium nitrate provides a good alternative to ammonium calcium nitrate as regards the liming effect. This property of being effective at deeper levels of the root zone, is likely to be of particular value. Urea can be regarded as a neutral nitrogen fertilizing agent, suitable from the soil conservation viewpoint, on non-nitrifying soils. In the past its use as nitrogen fertilizer has, however, been restricted because of its low efficiency as compared with ammonium nitrate. 9 refs., 1 fig., 3 tabs.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 38870, 38878, 38912, 38915, 38933, 38938, 38939, 38940, 38949, 38950, 39342, 39890, 40137, 40141, 40143, 40144, 40145, 40146, 40158, 40387, 40890, 40892

40168 (EGG—10282-1071) Aerial radiological survey of the Diablo Canyon Nuclear Power Plant and surrounding area, Diablo Canyon, California. Date of survey: September-October 1984. (EG and G, Inc., Las Vegas, NV (USA). Remote Sensing Lab.). Mar 1985. Contract AC08-83NV10282. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015238.

An aerial radiological survey was conducted over the area surrounding the Diablo Canyon Nuclear Power Plant in Diablo Canyon, California. The survey was conducted between 20 September and 3 October 1984. A series of flight lines parallel to the coastline were flown at an altitude of 91 meters (300 feet) and were spaced 152 meters (500 feet) apart. The survey covered an area of 250 square kilometers (100 square miles). The resulting background exposure rates over the survey area ranged from 5 to 21 microroentgens per hour (μR/h). The reported exposure rate values include an estimated cosmics ray contribution of 3.6 μR/h. Soil samples were also collected at several locations within the survey areas and analyzed in the laboratory for isotopic composition. The results of the survey showed only the presence of naturally occurring background radiation. No man-made radioactivity was detected. 4 refs., 4 figs., 4 tabs.

40169 (NUREG—0837-Vol.4-No.4) NRC TLD Direct Radiation Monitoring Network. Progress report, October-December 1984. Volume 4, No. 4. Jang, J.; Kramaric, M.; Cohen, L. (Nuclear Regulatory Commission, King of Prussia, PA (USA). Region I). Jul 1985. 315p. NTIS, PC A14/MF A01 - GPO. File Number TI85901853.

This report presents the results of the NRC Direct Radiation Monitoring Network for the fourth quarter of 1984. It provides the ambient radiation levels measured in the vicinity of 73 sites throughout the United States. In addition, it describes the equipment used, monitoring station selection criteria, characterization of the dosimeter response, calibration procedures, statistical methods, intercomparison, and quality assurance program. 4 figs., 4 tabs.

40170 (NUREG—0837-Vol.5-No.1) NRC TLD direct radiation monitoring network. Progress report, January-March 1985. Volume 5, No. 1. Jang, J.; Kramaric, M.; Cohen, L. (Nuclear Regulatory Commission, King of Prussia, PA (USA). Region I). Jul 1985. 149p. NTIS, PC A07/MF A01 - GPO. File Number TI85901860.

This report presents the radiation levels measured in the vicinity of NRC licensed facility sites throughout the country for the first quarter of 1985.

40171 (OAEP—1-105) Plutonium in soil and surface air in Thailand. Chittaporn, P.; Siripirom, L. (Office of Atomic Energy for Peace, Bangkok (Thailand)). Dec 1983. 17p. (In Thai). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701621.

Plutonium in soil and surface air in the central part of Thailand have been investigated. The sample is dissolved in potassium fluoride and pyrosulfate fusions, and precipitate barium sulfate. The plutonium is separated by solvent extraction with HDEHP from perchloric acid medium. Finally the plutonium is coprecipitated with 50 μg of cerium carrier. The precipitate is filtered on a 25 mm glossy membrane filter with a 0.1 μm pore size, and analyzed with a 300 mm^2 surface-barrier detector at about 20 percent counting efficiency. The range of Plutonium-239, 240 in soil were 0.002 to 0.157 pCi/g.dry. Plutonium-239, 240 in surface air in July 1981 were 7.7 +- 2.1 aCi/m^3 and lower than the limit of detector from August to November 1981.

40172 (SAAS—319) Interpretation of soil-type maps of forestry in terms of terrestrial gamma-ray dose rate. Kopp, D.; Hannemann, M.; Obrikat, D.; Will, W. (Staatliches Amt fuer Atomsicherheit und Strahlenschutz, Berlin (German Democratic Republic)). 1984. 39p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701602.

Measurements have been performed in the lowlands of the G.D.R. to determine the activity concentration of ^{40}K, ^{226}Ra and ^{232}Th in soil as well as the terrestrial γ-ray dose rate at the soil surface and 1 m above. The results demonstrate that the dose rate due to terrestrial radiation can be assessed by means of forest site maps indicating the potassium content of the various soils. Two examples were presented to explain the approach.

40173 (SKBF-KBS-TR—84-05) Diffusion in clay - experimental techniques and theoretical models. Eriksen, T.E.; Jacobsson, A. (Swedish Nuclear Fuel Supply Co., Stockholm). 28 Jun 1984. 37p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781085.

A large number of experiments have been carried out by this and adjacent research groups to assess the diffusivity of a wide variety of dissolved species such as cations anions, macromolecules and gases in water-saturated clay at differing compaction. The results have been reported in a series of KBS-technical reports. This report is a summary of the experiences gained by these experiments. Recommended experimental methods are described and a methodology to treat and interpret the experimental data is outlined. The mechanisms for diffusion in clay are also discussed in some detail -

especially the influence of charge, molecular size and hydrolysis of the diffusing species.

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 38864

40174 **(GAO/RCED—85-75) EPA's inventory of potential hazardous waste sites is incomplete.** Bowsher, C.A. (General Accounting Office, Washington, DC (USA). Office of the Comptroller General). 26 Mar 1985. 41p. US General Accounting Office, Box 6015, Gaithersburg, MD 20877. File Number TI85901754.

A complete inventory of hazardous waste sites does not exist. EPA reports that there could be many additional hazardous waste sites added to its inventory if aggressive and systematic discovery programs are undertaken. For the most part, EPA has concentrated its resources on evaluating and cleaning up known sites rather than searching for new ones. Three of the seven states GAO reviewed had systematic discovery programs. Each of the states also identified sites through citizen complaints and other methods. Collectively the states discovered 837 sites. GAO found, however, that not all of these sites had been reported to EPA, including some that may warrant addition to EPA's National Priorities List. EPA's cleanup authority is broad. Because of limited resources, however, it has decided to generally limit its cleanup activities to sites on the National Priorities List. States nationwide will be responsible for taking cleanup action if necessary at those sites not targeted for EPA action.

40175 **(ORNL/TM—6803/S5) White-tailed deer (Odocoileus virginianus) on the Department of Energy's Oak Ridge Reservation: 1982 status report.** Story, J.D.; Kitchings, J.T. (Oak Ridge National Lab., TN (USA)). Jun 1985. Contract AC05-84OR21400. 25p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015052.

Environmental Sciences Division Publication No. 2333.

One hundred nine white-tailed deer were killed by vehicles on the Department of Energy's Oak Ridge Reservation during 1982, a decrease of six from the vehicle kills in 1981. Spatial and temporal patterns of mortality were similar to those reported previously. The highest number of deer killed was recorded during November. The sex ratio of road-kills was 0.6:1 (males to females) from January through September, but it shifted to 3.6:1 for the October through December period, presumably reflecting the effects of rutting season on bucks' movements. Reproductive data collected indicated a breeding season from early October through late March. Postmortem examination of deer revealed that animals were in good condition (only a few abnormalities were observed), and endoparasite burdens continue to reflect no overcrowding in the deer population. 5 refs., 6 figs., 9 tabs.

40176 **(PB—85-178796/XAB) Estimating postfire changes in production and value of northern Rocky Mountain-Intermountain rangelands. Final report.** Peterson, D.L.; Flowers, P.J. (Forest Service, Berkeley, CA (USA). Pacific Southwest Forest and Range Experiment Station). Dec 1984. 26p. (FSRP-PSW—173). NTIS, PC A03/MF A01.

A simulation model was developed to estimate postfire changes in the production and value of grazing lands in the Northern Rocky Mountain-Intermountain region. Ecological information and management decisions were used to simulate expected changes in production and value after wildfire in six major rangeland types: permanent forested range (ponderosa pine), transitory range (Douglas-fir, larch, lodgepole pine, western white pine), Mountain grassland, sagebrush, pinyon-juniper, and western hardwoods. Changes varied widely in quantity and duration among the range types. The largest decrease in net value was calculated for mountain grassland ($7/acre for a 2-year period). The largest increase in net value was calculated for a ponderosa pine sawtimber stand with 100 percent basal area removal ($36/acre for a 150-year period).

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5106 Regulations

REFER ALSO TO CITATION(S) 40174

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 38898

40177 **(INIS-mf—9573-Vol.3, pp 491-505) Stream flow measurements by radioactive tracer techniques.** Estrada Tinajero, P. (Instituto Nacional de Investigaciones Nucleares, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781444.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

The stream flow of a river was calculated by recuperating samples of a radioactive tracer first introduced into the river and later collected as the waters were forced or flowed naturally downstream.

40178 **(NP—5901731) Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest) - California grunion.** Fritzsche, R.A.; Chamberlain, R.H.; Fisher, R.A. (Humboldt State Univ., Arcata, CA (USA). Dept. of Fisheries). Feb 1985. 19p. NTIS, PC A02/MF A01. File Number DE85901731.

Biological report 82(11.28).

The California grunion (Leuresthes tenuis) has little commerical importance but is one of the most popular sport fish along the beaches of southern California. California grunion spawn on sand beaches about every 2 weeks (as many as eight spawning per female) during full and new moon tide cycles. The spawning season begins in February-March and may extend to early September. The eggs hatch in about 2 weeks. California grunion mature at young age and have a life span of about 3 years. Larvae and adults prey on planktonic organisms, primarily copepods. Eggs are preyed upon by beach scavengers; adults are forage for larger piscivores. They host several crustacean and digenetic trematode parasites. 34 refs., 2 figs.

40179 **(NP—5901732) Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Gulf of Mexico) - Sheepshead.** Jennings, C.A. (Mississippi State Univ., Mississippi State (USA). Dept. of Wildlife and Fisheries). Mar 1985. 17p. NTIS, PC A02/MF A01. File Number DE85901732.

Biological Report 82(11.29); TR EL-82-4.

The sheepshead, Archosargus probatoceuphalus, contributes moderately to the multi-million dollar commercial and sport fishery in the northern Gulf of Mexico. Commercial landings for 1982 were 558 t valued at $225,300; more than 1.8 million sheepshead were caught by anglers in 1979. Juveniles and adults move offshore as temperatures decline in fall. Spawning probably takes place in offshore waters during the spring. Larvae move inshore to grass flats in estuaries where they feed on soft plants and animals. Juveniles and adults live near structures on the bottom, such as pilings, or along the shore; they are omnivorous, but primarily eat mollusks and crustaceans. Sheepshead can tolerate wide ranges of temperatures and salinities. Little is known about the actual time of inshore and offshore movements, growth rate, age composition, role in trophic dynamics of estuaries, and age at maturity. 44 refs., 2 figs., 1 tab.

40180 **(NP—5901733) Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Gulf of Mexico) - southern flounder.** Reagan, R.E. Jr.; Wingo, W.M. (Mississippi State Univ., Mississippi State (USA). Dept. of Wildlife and Fisheries). Apr 1985. 16p. NTIS, PC A02/MF A01. File Number DE85901733.

Biological report 82(11.30).

Southern flounder is a estuarine dependent species and lives its entire life in or near estuaries. The southern flounder migrates out of the estuary into the Gulf of Mexico to spawn in October through February. Larvae and juveniles usually live in esturine areas, but some juveniles live in nearshore areas in the Gulf of Mexico. The species has a maximum age of 10 years. Southern flounders are caught commercially by shrimp trawlers and a few are caught by gigging. Commercial landings (1971-1981) have ranged from 1,169,800 to 28,615 lb. There are no data on sport catches of the species. Population dynamics data on the species are weak. Larval and juvenile flounders eat invertebrates. Adults eat a variety of fish and shrimp. Adult southern flounder have been caught in water with temperatures of 5° to 35°C. The species has been caught in water at salinities of 0-36 ppt. Southern flounder prefer mud bottoms over other types. 28 refs., 2 figs., 1 tab.

40181 (USGS-OFR—84-723) Controls on the variance in chemistry of three lakes in the Flat Tops Wilderness Area, Colorado. Turk, J.T. (Geological Survey, Lakewood, CO (USA)). 1984. 28p. US Geological Survey Open File Services, Box 25425, Denver Federal Center, Denver, CO 80225. File Number TI85901774.

The chemistry of three dilute lakes in the Flat Tops Wilderness Area, Colorado, can be divided into three principal components: (1) biologically controlled characteristics or constituents that vary as a function of growing conditions, (2) constituents with concentrations that are determined by the degree of chemical weathering, and (3) constituents with concentrations that result from solubility controls, or a steady-state concentration resulting from relatively constant sources. pH is an example of a biologically controlled characteristic; calcium is an example of a chemical-weathering controlled constituent; aluminum is an example of a constituent that may be controlled by the solubility of a mineral (gibbsite), whereas sulfate is an example of a constituent controlled by precipitation. Although quite variable during the ice-free season, pH can be predicted from processes that regulate photosynthesis. The use of simple models relating pH to controls on light intensity (cloud cover and time-of-day), and to stage during the growing season (julian date), explains as much as 63% of the variance in pH. Thus, the detection of trends in pH resulting from changes in precipitation chemistry can be greatly simplified by the use of these models. Most chemical constituents measured in this study seem to vary in concentration about a mean value, with little or no trend during the ice-free season. Mineral solubility may control the concentration of some constituents, and tend to keep that concentration constant, barring major changes in watershed chemistry. Other constituents have concentrations that probably result from the averaging-effect of snowpack accumulation on atmospheric sources. Thus, changes of average concentrations in these lakes could be detected by statistically different mean values in the future. If the same changes are measured in precipitation, then the importance of the atmospheric source to lake chemistry will be documented. 8 refs., 1 fig., 11 tabs.

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 38723, 39466, 40123, 40125, 40126, 40127, 40155, 40156, 40159, 40344, 40363

40182 (BNL—36723) Regional perspective on aquatic effects of acid deposition. Hendrey, G.R. (Brookhaven National Lab., Upton, NY (USA)). Mar 1983. Contract AC02-76CH00016. 10p. (CONF-8303116—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014820.

From Workshop on acid deposition causes and effects - a state assessment model; Gainesville, FL, USA (23 Mar 1983).

Acidification of surface waters has occurred in several areas of the world. Thousands of water bodies have been altered. In many individual cases the relationship to acid deposition is not conclusively proven so debate continues concerning the cause. It is difficult, if not impossible, to prove to everyone's satisfaction that no factor other than acid deposition is responsible for acidification of a particular water body. A critical approach to assessing the impacts of acid deposition by evaluating each study individually can usually find one or more flaws in chemical analysis, or in the logic and assumptions of interpretations linking acid deposition to acidification at a particular site. The danger in such an approach, however, is that the overall body of evidence is not examined as a whole: the forest is not seen through all of the trees. An alternative approach is to evaluate cause-effect relationships of acidification on a regional basis. There is a striking coincidence between regions in which acidification is observed and annual average acidity of wet deposition expressed as pH of 4.7 or less (or wet sulfate deposition of 2 g m^{-2} yr^{-1} or more). While wet deposition pH and wet sulfate deposition represent a large fraction of total acids or acid forming substances deposited ("acid deposition"), they appear to be reasonable surrogates for total deposition of acids and acid forming substances (SO/sub x/, NO/sub x/, NH_4). Within acidified waters sulfate is the major anion and it dominates the chemistry of acidified waters. In most cases no source for sulfate ions other than atmospheric deposition can be demonstrated. Nitrate correlates well with peak acidity in areas having persistent snow pack but it can be shown that episodes of high acidity would be much less severe if sulfate were absent. 19 refs.

40183 (DOE/ER—0219) Research highlights subsurface transport program. Physical-chemical mechanisms affecting transport of inorganic/organic microcontaminants in heterogeneous systems. Anderson, M.A. (USDOE Office of Energy Research, Washington, DC. Ecological Research Div.; Wisconsin Univ., Madison (USA)). Mar 1985. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015037.

Subsurface solute transport in solid-aqueous systems of nonconservative chemical species is often controlled by adsorption and desorption reactions. Three projects are briefly discussed which utilize alternate experimental techniques: (1) adsorbate induced particle-particle aggregation analyzed by electrophoretic mobility distribution; (2) heats of anion adsorption using microcalorimetry; and (3) in situ studies of salicylic acid adsorption on goethite using CIR-FTIR Spectroscopy. 7 refs., 2 figs. (ACR)

40184 (DOE/EV/10429—T2, pp 41-56) **Annual sea ice. An air-sea gas exchange moderator.** Gosink, T.A.; Kelley, J.J. (Univ. of Alaska, Fairbanks). Jun 1985. NTIS, PC A10/MF A01. File Number DE85014054.

In Carbon dioxide in arctic and subarctic regions. Final report.

Arctic annual sea ice, particularly when it is relatively warm (>-15°C) permits significant gas exchange between the sea and air throughout the entire year. Sea ice, particularly annual sea ice, differs from freshwater ice with respect to its permeability to gases. The presence of brine allows for significant air-sea-ice exchange of CO_2 throughout the winter, which may significantly affect the global carbon dioxide balance. Other trace gases are also noted to be enriched in sea ice, but less is known about their importance to air-sea-interactions at this time. Both physical and biological factors cause and modify evolution of gases from the surface of sea ice. Quantitative and qualitative descriptions of the nature and physical behavior of sea ice with respect to brine and gases are discussed. 23 refs., 2 figs.

40185 (DOE/EV/10429—T2, pp 104-130) **Carbon dioxide and nitrous oxide in the surface waters of the Norwegian, Barents and East Greenland Seas-YMER CRUISES.** Gosink, T.A.; Kelley, J.J. (Univ. of Alaska, Fairbanks). Jun 1985. NTIS, PC A10/MF A01. File Number DE85014054.

In Carbon dioxide in arctic and subarctic regions. Final report.

Nitrous oxide and carbon dioxide concentrations in the Norwegian, Barents, and East Greenland Seas are reported. 5 refs. (ACR)

40186 (GKSS—84/E/45) Evaluation of heavy metal contents in non tidal influenced Elbe river water during 1979/80. Wilken, R.D.; Weiler, K. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1984. 9p. (CONF-840781—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE85752201.

From International conference on environmental contamination; London, UK (10 Jul 1984).

From summer 1979 until summer 1980 water samples were taken at the Elbe dam at Geesthacht (FRG) and the contents of

Cd, Cu, Fe, Hg, Mn, Zn, and particulate matter were determined. The average water discharge of the Elbe river during this period was approx. = 870 m^3/s. The variation of the concentrations can be correlated with the different water discharges and it is concluded, that high water discharges reduce the amount of heavy metal contaminated particulate matter, found in the deposits.

40187 **(JAERI-M—83-149) Study on the experimental method of chlorine treatment of raw drinking water.** Arai, Hidehiko; Arai, Michimasa; Miyata, Teijiro; Sakumoto, Akihisa. (Japan Atomic Energy Research Inst., Tokyo). Sep 1983. 57p. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. File Number DE85701601.

Reduction of carcinogenic trihalomethanes (THM) formed in drinking water by chlorine disinfection is a serious problem in the world at present. In advance of a study to depress the formation of THM by a simultaneous use of radiation and ozone, the experimental methods of measuring of THM and total organic halogen (TOX), chlorine treatment and preparation of humic samples were reviewed. This study proved that (1) chlorination in a vial enables the simultaneous measurement of THM and TOX, (2) addition of nitric acid depresses the hydrolysis of halogenated organics, (3) water-soluble sodium bisulfite can be used as a good dehalogenating reagent, and (4) humic samples prepared from humus are suited for the experiment of chlorine treatment of raw drinking water.

40188 (LBL—16920, pp 47-50) **Use of mathematical models for subsurface contaminant transport assessment.** Javandel, I.; Doughty, C.; Tsang, C.F. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40189 **(USGS-OFR—84-439) Assessment of water resources in lead-zinc mined areas in Cherokee County, Kansas, and adjacent areas.** Spruill, T.B. (Geological Survey, Lawrence, KS (USA). Water Resources Div.). 1984. 110p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901786.

A study was conducted to evaluate water-resources problems related to abandoned lead and zinc mines in Cherokee County, Kansas, and adjacent areas in Missouri and Oklahoma. Past mining activities have caused changes in the hydrogeology of the area. Lead and zinc mining has caused discontinuities and perforations in the confining shale west of the Pennsylvanian-Mississippian geologic contact (referred to as the western area), which have created artificial ground-water recharge and discharge areas. Recharge to the shallow aquifer (rocks of Mississippian age) through collapses, shafts, and drill holes in the shale has caused the formation of a groundwater "mound" in the vicinity of the Picher Field in Kansas and Oklahoma. Discharge of mine-contaminated ground water to Tar Creek occurs in Oklahoma from drill holes and shafts where the potentiometric surface of the shallow aquifer is above the land surface. Mining of ore in the shallow aquifer has resulted in extensive fracturing and removal of material, which has created highly transmissive zones and voids and increased ground-water storage properties of the aquifer. In the area east of the Pennsylvanian-Mississippian geologic contact (referred to as the eastern area), fractured rock and tailings on the land surface increased the amount of water available for infiltration to the shallow aquifer; in the western area, tailings on the impermeable shale created artificial, perched aquifer systems that slowly drain to surface streams. 45 refs., 23 figs., 21 tabs.

40190 **(USGS/WRI—83-4152) Fluvial sedimentation in Kentucky.** Flint, R.F. (Geological Survey, Louisville, KY (USA)). Dec 1983. 84p. US Geological Survey, Open File Service, Box 25425, Federal Center, Lakewood, CO 80225. File Number TI85901793.

This report, covering periods 1942-45 and 1951-81, documents the characteristics of sediment being transported from 79 drainage areas within the Commonwealth of Kentucky, and at eight stations on the main stem of the Ohio River. The drainage areas, excluding the Ohio River, range in size from 0.67 square mile on Cane Branch near Parkers Lake to 40,330 square miles on the Tennessee River near Paducah. The drainage areas on the Ohio River range from 62,000 square miles at Greenup Dam to 203,100 square miles at Lock and Dam 53 near Grand Chain, Illinois. Sediment yields and particle size of suspended and bed sediments are discussed for the five major physiographic regions of Kentucky and for the Ohio River stations. The Blue Grass region had the highest average annual suspended-sediment discharge of 741 tons per square mile. The Eastern Coal Field had the broadest range of average annual yields ranging from 25 tons per square mile at Helton Branch near Greenwood to 21,000 tons per square miles at Millers Creek near Phyllis. For sampling stations, the Jackson Purchase region had the highest median value of annual suspended-sediment yield of 535 tons per square mile. 53 refs., 12 figs., 33 tabs.

40191 **(USGS/WRI—83-4162) Quality of water, Quillayute River basin, Washington.** Fretwell, M.O. (Geological Survey, Tacoma, WA (USA)). 1984. 104p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901792.

Ground water in the Quillayute River basin is generally of the calcium bicarbonate type, although water from some wells is affected by seawater intrusion and is predominantly of the sodium chloride type. The water is generally of excellent quality for most uses, with the exception of water in two wells which had iron concentrations that potentially could be tasted in beverages and could cause staining of laundry and porcelain fixtures. A comparison of the chemical compositions of ground and surface waters showed a strong similarity over a wide geographic area. Proportions of the major chemical constituents in the rivers of the basin were nearly constant despite concentration fluctuations in response to dilution from precipitation and snowmelt. River-water quality was generally excellent, as evaluated against Washington State water use and water-quality criteria. Fecal-coliform bacteria counts generally were much lower than the total-coliform bacteria counts, indicating that most of the coliform bacteria were of nonfecal origin and probably originated in soils. Fecal coliform concentrations in all the major tributaries met State water-quality criteria. Water temperatures occasionally exceeded criteria maximum during periods of warm weather and low streamflow; dissolved-oxygen concentrations were occasionally less than criteria minimum because of increased water temperature. Both conditions occurred naturally. Nutrient concentrations were generally low to very low and about the same as in streams from virgin forestland in the Olympic National Park. However, some slight increases in nutrient concentrations were observed, particularly in the vicinity of Mill Creek and the town of Forks; due to dilution and biological assimilation, these slightly elevated concentrations decreased as the water moved downstream. 35 refs., 24 figs., 16 tabs.

40192 **Associations and mesoscale spatial relationships among rainwater constituents.** Gatz, D.F. (Illinois State Water Survey, Urbana). *Journal of Geophysical Research;* **85**: No. C10, 5588-5598(20 Oct 1980). (CONF-790842—). Contract AC02-76EV01199.

From International conference of global atmospheric pollution; Boulder, CO, USA (12 Aug 1979).

In a search for clues to the nature of aerosol scavenging and precipitation formation processes in convective storms, daily rain samples were collected in networks of 80 or 85 open polyethylene containers near St. Louis during the summers of 1972-1975. Collected samples were filtered to separate soluble and insoluble materials, and both fractions were analyzed for a variety of constituents, including Li, Na, Mg, K, Ca, Fe, Zn, Cd, Pb, and SO_4/sup =/. To investigate which element/solubility fractions had similar deposition patterns and how these patterns related to each other and to rainfall, individual storms were analyzed by factor analysis. The results showed that deposition patterns grouped consistently into four main types: (1) soluble soil elements, (2) insoluble soil elements, (3) soluble pollutant elements, and (4) insoluble pollutant elements. Differences between the deposition patterns of pollutants and soil elements may be accounted for by the distribution of sources, but differences between soluble and insoluble portions of the same element probably reflect important differences in scavenging and/or precipitation formation processes. These processes may be amenable to further investigation using techniques similar to those described in this paper. 12 references, 3 figures, 13 tables.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 38902, 38937, 38940, 38941, 38946, 38947, 38950, 38951, 39342, 39954, 40136, 40143, 40144, 40145, 40146, 40396, 40890, 40892

40193 **(ARL/TR—064) Assessment of radioactivity in the environs of a titanium dioxide plant at Bunbury, Western Australia.** Cooper, M.B.; Williams, G.A. (Australian Radiation Lab., Melbourne). Mar 1984. 30p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781087.

A study of radioactivity levels in environmental samples collected from the environs of a ttanium dioxide plant at Bunbury in Western Australia is described. Radioactivity levels were determined in samples of sediment, water, algae and seafood (crabs and mussels) from the Leschenault Inlet, close to the site at which the plant's liquid effluent is disposed, and from other areas along the south-west coast. Samples of town drinking water were also analysed. Radioactivity levels in the ilmenite feed and effluent of the plant are approximately half those observed in an earlier study. There is evidence for an enhancement of radionuclide concentrations in sediment from Leschenault Inlet originating from the plant effluent. Despite this effect, radioactivity levels in the sediment of the Inlet are no greater than those that occur at certain other locations along the south-west coast. The investigation of radioactivity levels in water, algae and seafood indicates that the only significant transfer of radionuclides from the sediment is the bioaccumulation of radium in algae. There is effectively no risk to the health of members of the public who consume crab flesh or mussels from Leschenault Inlet.

40194 **(IFE/KR/E—84/009) Freshwater exposure pathways in the Nordic countries.** Tveten, U. (Institute for Energy Technology, Kjeller (Norway)). Jun 1984. 35p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781088.

The report relates to a subproject under a Nordic project called "Large reactor accidents - consequences and mitigating actions". The report summarizes information available, primarily in the Nordic countries, on freshwater exposure pathways. Experimental and theoretical data concerning the deposition and run-off of the nuclides *sp90*Sr and*Sp137*Cs is presented. Internal exposure via drinking water and freshwater fish is dealt with, as well as external exposure due to swimming, boating, contact with fishing utensils and use of beach areas. In addition is exposure via irrigated agricultural products considered.

40195 (INIS-mf—9481, pp 158-165) **Gamma spectrometry determination of radionuclides in water samples from the environs of nuclear power plants.** Slavik, O.; Janecka, S. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice (Czechoslovakia)). 1982. (In Slovak). NTIS (US Sales Only), PC A10/MF A01. File Number DE85780894. (CONF-8209269—).

From Radionuclides and ionizing radiation in water management conference; Liberec, Czechoslovakia (8 Sep 1982).

A GE(Li) detector calibration method was elaborated for gamma spectrometric measurements of large volume samples. A semi-analytical expression is presented of the dependence of detection efficiency on energy, height of sample and its density in a cylindrical configuration for samples containing Si, Al, C, H_2O. The values of efficiency calculated in this manner are compared with experimentally determined values for a cylindrical configuration (diameter 10 cm) with an aqueous calibration solution. A comparison is made of various cylindrical configurations.

40196 (LBL—16920, pp 205-208) **Radon-222 in groundwater of the Long Valley caldera, California.** Wollenberg, H.A.; Flexser, S.; Smith, A.R.; Mosier, D.F. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40197 **(PNL—5407) Environmental monitoring at Hanford for 1984.** Price, K.R.; Carlile, J.M.V.; Dirkes, R.L.; Jaquish, R.E.; Trevathan, M.S.; Woodruff, R.K. (Pacific Northwest Labs., Richland, WA (USA)). May 1985. Contract AC06-76RL01830. 141p. NTIS, PC A07/MF A01; GPO Dep. File Number DE85014393.

Environmental surveillance activities performed by the Pacific Northwest Laboratory for the Department of Energy's Hanford Site for 1984 are discussed in this report. Samples of environmental media were collected in support of the Hanford Environmental Monitoring Program to determine radionuclide concentrations in the Hanford environs. Radiological impacts in terms of radiation dose equivalents as a result of Hanford operations are also discussed. Gross beta radioactivity concentrations in airborne particulates at all sampling locations were lower in 1984 than during 1983 as a result of declining levels of worldwide fallout. Slightly higher levels of ^{85}Kr and ^{129}I were noted at several onsite and offsite locations. The sampling location in close proximity to the PUREX plant also detected increased ^{3}H. Very low levels of radionuclides were detected in samples of Columbia River water during 1984. An extensive groundwater monitoring program was performed for the Hanford Site during 1984. The ^{3}H and nitrate plumes continued to move slowly toward the Columbia River. All ^{3}H results were within applicable concentration guides. Samples of deer, rabbits, game birds, waterfowl and fish were collected onsite or in the Columbia River at locations where the potential for radionuclide uptake was most likely, or at the nearest locations where wildlife samples were available. Radioisotope levels were measured. Dose rates from external penetrating radiation measured in the vicinity of residential areas were similar to those observed in the previous years, and no contribution from Hanford activities could be identified. An assessment of the 1984 potential radiological impacts attributable to the Hanford operations indicated that measured and calculated radiation doses to the public continued to be low, and well below applicable regulatory limits. 21 refs., 48 figs., 83 tabs.

40198 (WSD-Misc—60, pp 29-31) **Use of stable carbon isotope ratios as a problem solving tool in ecological research.** Rounick, J.S. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781281. (CONF-8211207—).

From Seminar on nutrient processing and biomass production in New Zealand estuaries; Nelson, New Zealand (10 Nov 1982).

Summary only.

40199 **(WSD-Misc—60) Nutrient processing and biomass production in the New Zealand estuaries.** Gillespie, P.A. (ed.). (National Water and Soil Conservation Organization, Wellington (New Zealand)). 1983. 91p. (CONF-8211207—). NTIS (US Sales Only), PC A05/MF A01. File Number DE85781281.

From Seminar on nutrient processing and biomass production in New Zealand estuaries; Nelson, New Zealand (10 Nov 1982).

Items within the scope of EDB have been entered individually into the data base. (LM)

53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

5301 Social And Economic Studies

REFER ALSO TO CITATION(S) 38876

40200 **(NP—5770322) Deregulation in environmental policy.** Orth, J. (Mainz Univ. (Germany, F.R.). Forschungsinstitut fuer Wirtschaftspolitik). 1983. 79p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE85770322.

In the USA the attempt is being made for the first time to leave the solution of the apparent conflict between economy and ecology to a considerable extent to the powers of the market. The

framework conditions and rules for that market are characterized by the new approaches of 'deregulation': 'They create a market in which business can make a profit by producing clean air and water.' The aim of the volume is to present that new strategy, with regard to the sector of air pollution, in its individual components, explain their mode of function and briefly indicate associated problems. However, before dealing with the new approaches based on free enterprise, the publication provides some basic information current legislation in the USA regarding air pollution.

5302 Assessment Of Energy Technologies

REFER ALSO TO CITATION(S) 38724, 39103, 39468

40201 **(EPRI-EA—4020) Analysis of routine occupational risks associated with selected electrical energy systems. Final report.** Cox, L.A. Jr.; Fiksel, J.; Kalelkar, A.S. (Little (Arthur D.), Inc., Cambridge, MA (USA)). Jul 1985. 291p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920753.

The purpose of this study is two-fold to critically review the applicability of a conventional risk analysis approach to the assessment of human health and safety risks in the area of electricity production; and to suggest and demonstrate possible methodological improvements in current approaches. Based on a review of important past studies, a general methodology that is representative of state-of-the art approaches is proposed, and this methodology is applied to the comparative risk analysis of eight selected electricity-producing processes. A process analysis approach is used throughout. Each energy producing system is decomposed into stages, and the risks at each stage are analyzed separately. Risk estimates from each stage are normalized to give common units (e.g., fatalities per unit energy produced), and the normalized estimates are summed across stages to obtain a risk estimate for the system as a whole. The eight electricity-producing systems considered use coal, oil, natural gas, wood biomass, nuclear fission, solar thermal radiation, solar photovoltaic energy, and wind, respectively, as the energy source. Even though the risks per unit energy from different processes are expressed in common units (primarily fatalities per GWe-year of electricity produced), there is no implication that one technology can be substituted for another. Methodological weaknesses, methods of calculation, interpretation of the output, and uncertainties in the data used and inferences drawn are discussed in detail. 196 refs., 15 figs., 44 tabs.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5501 Behavioral Biology

REFER ALSO TO CITATION(S) 39670, 39671, 40337, 40338, 40339

40202 (INIS-mf—9655, pp 35) **Impact of coastal geological changes of shoreline environments on man's occupancy, 400 AD to present, NE O'ahu Coast, Hawaii.** Kraft, J.C. (Delaware Univ., Newark (USA). Dept. of Geology). 1983. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441. (CONF-830288—Absts.).

From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).

Abstract only.

5502 Biochemistry

REFER ALSO TO CITATION(S) 39004, 40211

40203 **(DOE/ER/10901—1) Corn storage protein: a molecular genetic model. Final report.** (Minnesota Univ., St. Paul (USA). Dept. of Biochemistry). 1985. Contract AC02-81ER10901. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015376.

An extensive study is reported on the nucleotide sequences of the genes in maize encoding the most abundant class of storage proteins in the endosperm tissue, the zein protein family. These studies emphasize recombinant DNA technology using the M13 cloning system to produce the data and the aid of a computer in analyzing the data. These techniques were used to study differential gene expression in an economically important plant, corn. To understand the control mechanism of gene expression during tissue development, we have chosen the zein multigene family as a molecular genetic model. These genes represent a particularly interesting case because zein proteins accumulate in large quantities, are synthesized exclusively in the endosperm tissue, consist of a large closely related family of proteins, and are synthesized during a brief period of development. They make up to 50 to 60% of the total protein in the corn kernel and therefore represent a major component in the feed of livestock. Ultimately, the physical basis of the control of the expression of these genes must reside in their nucleotide sequence. 24 refs.

40204 **(DOE/ER/10944—4) Development of a genetic system in Bacteroides. Final report, June 14, 1981-June 14, 1985.** Gardner, J.F.; Salyers, A.A. (Illinois Univ., Urbana (USA). Dept. of Microbiology). 3 Jul 1985. Contract AC02-81ER10944. 10p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015374.

We have constructed a chimeric plasmid, pE5-2, that can be mobilized from E. coli to Bacteroides by the broad host range plasmids R751 and RK2. pE5-2 is maintained in Bacteroides and carries a gene for resistance to erythromycin-clindamycin that is expressed in Bacteroides. We have discovered and described the first Bacteroides transposon, Tn4351 and we have shown that this transposon also mediates the integration of R751 into the chromosome. This feature may serve as a basis for future construction of Hfr-type strains of Bacteroides. We have cloned and characterized a regulated Bacteroides gene that codes for a polysaccharidase (chondroitin lyase). The cloned DNA appears to contain the Bacteroides promoter. Finally, we have developed a method for rapid identification of some Bacteroides species, using species-specific cloned DNA fragments. These accomplishments provide for the first time a basis for genetic analysis of human colonic Bacteroides. 5 refs., 3 figs.

40205 **(DOE/OR/00033—T103) Base-pairing properties of O^6-methylguanine during DNA replication in vitro.** Snow, E.T. (Oak Ridge Associated Universities, Inc., TN (USA)). Dec 1982. Contract AC05-76OR00033. 109p. NTIS, PC A06/MF A01; GPO Dep. File Number DE85015018.

Thesis. Submitted to Univ. of Tennessee, Knoxville.

O^6-methylguanine (m^6G), because of its ability to "mispair" with thymine during replication, is an important premutagenic lesion produced in DNA by simple alkylating carcinogens. The kinetics of incorporation of nucleotide precursors opposite m^6G were analyzed during replication of synthetic deoxynucleotide polymers containing m^6dG as the only modified base by T5 phage-induced DNA polymerase. Incorporation of dTMP opposite m^6dG is preferred nearly ten-fold over incorporation of dCMP opposite m^6dG. dTTP and dCTP are linear competitive inhibitors for incorporation opposite m^6dG. dAMP is also incorporated opposite m^6dG but does not compete with dTMP incorporation. It is proposed that dA base-pairs with m^6dG in the dA/sub anti/:m^6dG/sub syn/ configuration. Different DNA polymerases vary in their ability to discriminate between dT:m^6dG and dC:m^6dG base-pairs. The relative number of mutations produced during replication of DNA containing m^6dG will depend on the DNA polymerase, DNA precursor pool concentrations, DNA sequence, and possibly other factors. Alkylated nucleotides in the DNA precursor pool may also contribute to mutagenesis induced by simple alkylating agents. m^6dGMP can be incorporated into DNA by several different DNA polymerases using both natural and synthetic template-primers. The rate of incorporation of m^6dGMP is significantly less than the rate of incorporation of normal dNTP substrates. Incorporation of m^6dGMP from the nucleotide pool will depend on the DNA polymerase, deoxynucleotide pool concentrations, and other possible factors. Mutagenesis due to m^6dGMP incorporation during DNA replication in vivo will be insignificant compared mutagenesis due to the m^6dG produced in DNA directly by simple alkylating carcinogens. 117 refs., 29 figs., 7 tabs.

40206 **(LA-UR—85-2175) Copper-binding protein in Mimulus guttatus.** Robinson, N.J.; Thurman, D.A. (Los Alamos National Lab., NM (USA); Liverpool Univ. (UK)). 1985. Contract W-7405-ENG-36. 5p. (CONF-850943—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014094.

From 5. international conference on heavy metals in the environment; Athens, Greece (10 Sep 1985).

A Cu-binding protein has been purified from the roots of Mimulus guttatus using gel permeation chromatography on Sephadex G-75 and anion exchange chromatography on DEAE Biogel A. The protein has similar properties to putative metallothioneins (MTS) purified from other angiosperms. Putative MT was estimated by measuring the relative percentage incorporation of (^{35}S) into fractions containing the protein after HPLC on SW 3000-gel. In the roots of both Cu-tolerant and non tolerant plants synthesis of putative MT is induced by increased Cu concentration in the nutrient solution. The relative percentage incorporation of (^{35}S) into putative MT is significantly higher in extracts from the roots of Cu-tolerant than non tolerant M. guttatus after growth in 1 μM Cu suggesting involvement in the mechanism of tolerance. 22 refs., 2 figs., 1 tab.

40207 **Kinetic characterization of the extracellular xylanases of Thermomonospora sp.** Ristroph, D.L.; Humphrey, A.E. (Univ. of Pennsylvania, Philadelphia). *Biotechnology and Bioengineering;* **27**: No. 6, 832-836(1985). Contract AC02-76ET20025.

This study deals with characterizing the extracellular xylanases produced by a strain of the thermophilic bacterial genus Thermomonospora. Supernatant from centrifuged fermentation broth was used as a crude enzyme preparation. From pH 5.5 to pH 7.7 the temperature optimum based on a 10-min assay of activity was 80°C. The crude enzyme had a half-life of approximately 1 month when stored at 55°C at pH 6.5. The enzyme produced a mixture of xylose oligomers from xylan, with xylobiose occurring in greatest quantity on a molar basis. Only trace quantities of xylose were produced by this hydrolysis.

40208 **Structure of the capsid of Kilham rat virus from small-angle neutron scattering.** Wobbe, C.R.; Mitra, S.; Ramakrishnan, V. (Univ. of Tennessee Oak Ridge Graduate School of Biomedical Sciences). *Biochemistry;* **23**: No. 26, 6565-6569(18 Dec 1984).

The structure of empty capsids of Kilham rat virus, an autonomous parvovirus with icosahedral symmetry, was investigated by small-angle neutron scattering. From the forward scatter, the molecular weight was determined to be 4.0 x 10(6), and from the Guinier region, the radius of gyration was found to be 105 A in D2O and 104 A in H_2O. On the basis of the capsid molecular weight and the molecular weights and relative abundances of the capsid proteins, the authors propose that the capsid has a triangulation number of 1. Extended scattering curves and mathematical modeling revealed that the capsid consists of two shells of protein, the inner shell extending from 58 to 91 A in D2O and from 50 to 91 A in H_2O and containing 11% of the capsid scattering mass, and the outer shell extending to 121 A in H_2O and D2O. The inner shell appears to have a higher content of basic amino acids than the outer shell, based on its lower scattering density in D2O than in H_2O. The authors propose that all three capsid proteins contribute to the inner shell and that this basic region serves DNA binding and partial charge neutralization functions.

5503 Cytology

REFER ALSO TO CITATION(S) 40068

40209 **Improved method for calculating labeling indices of lung epithelial and interstitial cells.** Shami, S.G.; Caton, T.M.; Griffith, W.C.; Evans, M.J. (Inhalation Toxicology Research Institute, Albuquerque, NM). *Journal of Toxicology and Environmental Health;* **15**: No. 2, 229-236(1985).

The sampling method was developed as in improvement in calculating labeling indices (LI) of epithelial and interstitial cells in the airways and alveolar region of the lungs of rats. This method is more accurate and requires less time than the traditional cytokinetic methods, which involve counting all labeled and unlabeled cells. In the sampling method, all labeled cells are counted, but the total number of cells is estimated based on a representative sample count of airway and alveolar cells in each animal. The LIs as calculated by the two methods correlated very well ($r > 0.97$). The small amount of error introduced by estimating the total number of cells was more than compensated for by the increased accuracy associated with a larger sample size.

5504 Genetics

40210 **(DOE/EV/03728—18) Mutagenic effect of radionuclides incorporated into DNA of Drosophila melanogaster. Progress report, July 15, 1984-July 15, 1985.** Lee, W.R. (Louisiana State Univ., Baton Rouge (USA). Dept. of Zoology and Physiology). 1985. Contract AS05-76EV03728. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85016110.

We have found that the most efficient analysis of mutants is carried out by using both the mutant protein and DNA. A sequential analysis of mutants at the molecular level has been developed. We found that of the seven apparently intragenic mutations disclosed, only three had normal southern blots and, as seen in two dimensional gels, only one of these produced a protein with a subunit which had normal molecular weight and electrical charge. The importance of this finding is that the molecular analysis was able to detect deletions missed by conventional genetic analysis even in a well developed genetic test system like Drosophila melanogaster. 4 refs., 1 fig. (DT)

40211 **(UCID—20315) Informal report of meeting on DNA methods for measuring the human heritable mutation rate held at Alta, Utah, December 9-13, 1984.** Mendelsohn, M.L. (Lawrence Livermore National Lab., CA (USA)). Jan 1985. Contract W-7405-ENG-48. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85006139.

A preliminary report is presented of a workshop to explore the role of new DNA methods in human heritable mutation detection. The idea for the workshop grew out of ICPEMC's desire to begin focussing attention on this potentially high leverage approach to a major problem in environmental mutagenesis and public health.

5506 Medicine

REFER ALSO TO CITATION(S) 39702, 39708, 39797, 39879, 40067

40212 **(CEA-CONF—7542) Perspective of diffusion of imaging technologies.** Gariod, R. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)). Oct 1984. 23p. (CONF-8409164—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE85751947.

From NATO advanced study institute on physics and engineering of medical imaging; Maratea, Italy (24 Sep 1984).

Medical imaging is dependant on the following techniques (ultra sounds, conventional radiology, digital radiology, X-ray computed tomography, NMR imaging, nuclear medicine). An overview of the forecast for world market evolution of medical imaging and the respective part taken by different techniques are presented.

40213 **(CEA-CONF—7543) Basic technological aspects and optimization problems in X-ray computed tomography (C.T.).** Allemand, R. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)). Oct 1984. 11p. (CONF-8409164—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE85751992.

From NATO advanced study institute on physics and engineering of medical imaging; Maratea, Italy (24 Sep 1984).

A competition is arising between C.T. and NMR in the field of medical diagnostic imaging, and it is clear that the medical community interest is presently focused on NMR imaging. Nevertheless, it appears reasonable to assume that the clinical interest of C.T. for different pathologies is remaining. As long as this statement is confirmed, new technical advances can be expected in the

near future in order to improve the main characteristics which are: the density resolution, the spatial resolution and the X-ray exposure time. Since only the technological aspects are concerned in this paper, the major advances can be expected in the field of photons flux production and detection. C.T. requires very stringent demands on X-ray tubes. Special tubes have already been developed for that application but further improvements are needed for high spatial resolution multislice machines. Multilinear array of detectors seems to be the major technological advance to accomplish in the near future in order to significantly improve the image quality, and to reach a true three-dimensional imaging.

40214 **(CEA-CONF—7544) Time-of-flight positron emission tomography (T.O.F. P.E.T.).** Allemand, R. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)). Oct 1984. 11p. (CONF-8409164—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE85751993.

From NATO advanced study institute on physics and engineering of medical imaging; Maratea, Italy (24 Sep 1984).

A new important step has been made in the performances of the time-of-flight positron imaging for the two last years. It has been proved that a high spatial resolution can be obtained with the T.O.F. technique. It has also been shown that the overall sensitivity (taking into account the sensitivity gain and BaF2 detection characteristics) is quite close to the one of conventional methods. On the other hand, the basic advantages related to the high counting rate capability, the random coincidences rejection etc... of course remain. It is probably safe to assume that significant improvements can be expected if new technological efforts are invested. Unfortunately, P.E.T. is a complex and expensive tool which has been only used up to now in the research groups (about 50 centers in the world). The justification of new technical developments will be quite clear when this modality will be considered in the assessment of diseases and in clinical diagnostic applications.

40215 **(CEA-CONF—7545) Strategies of reconstruction algorithms for computerized tomography.** Garderet, P. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)). Oct 1984. 2p. (CONF-8409164—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE85751994.

From NATO advanced study institute on physics and engineering of medical imaging; Maratea, Italy (24 Sep 1984).

Image reconstruction from projections has progressively spread out over all fields of medical imaging. As the mathematical aspects of the problem become more and more comprehensively explored a great variety of numerical solutions have been developed best suited to such-and-such imaging medical application and taking into account the physical phenomena related to data collection (a priori properties for signal and noise). The purpose of that survey is to present the general mathematical frame and the fundamental assumptions of various strategies; Fourier methods approximate explicit deterministic inversion formula for the Radon transform. Algebraic reconstruction techniques set up an a priori discrete model through a series expansion approach of the solution. The numerical system to be solved is huge when a fine grid of pixels is to be reconstructed; iterative solutions may then be found. Recently some least square procedures have been shown to be tractable which avoid the use of iterative methods. Finally maximum like hood approach incorporates accurately the Poisson nature of photon noise and are well adapted to emission computed tomography. The various strategies will be analysed from both aspects of theoretical assumptions needed for suitable use and of computing facilities, actual performance and cost. In the end we take a glimpse of the extension of the algorithms from two dimensional imaging to fully three dimensional volume analysis in preparation of the future medical imaging technologies.

40216 **(DOE/EV/04625—T4) Investigation of protein binding of radiogallium. Progress report.** Hoffer, P.B. (Yale Univ., New Haven, CT (USA)). 25 Jul 1985. Contract AC02-78EV04625. 49p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015578.

The main objective of the contract is to study aspects of the localization of gallium-67 in tumor are reported and compared with a new tumor imaging agent, specifically radiolabeled monoclonal tumor antibody. Our studies have demonstrated that phosphate compounds used in bone imaging do not significantly influence gallium-67 localization, that the adenosine triphosphate cannot be used to enhance gallium-67 uptake in malignant tissue, and that gallium-67 has higher affinity than radiolabeled anti-p97 for melanoma, even in tumors which produce significant amounts of p97 antigen on their cell surface. 23 refs., 17 figs., 5 tabs.

40217 **(EHD—83-100) Results of quality control studies of technetium 99m labelled radiopharmaceuticals prepared from kits (1980-81).** (Department of National Health and Welfare, Ottawa, Ontario (Canada). Health Protection Branch). 1983. 70p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701630.

French version included.

This report summarized the results of quality control studies of Tc 99m labelled human serum albumin, macroaggregated albumin, bone imaging and reticuloendothelial system imaging radiopharmaceuticals prepared from commercially available kits. It includes all analyses performed from January 1980 to December 1981 by the radiopharmaceutical quality control section of the Radiation Protection Bureau. These results were obtained by the application of various in vitro and animal (mouse) biodistribution studies.

40218 (INIS-mf—9477, pp 86-88) **Two-channel energy-selective workplace for isotope labs based on MMT system.** Billing, A.; Cserveny, L.; Maros, J.; Halpert, J.; Kari, B.; Margitfalvy, G.; Ster, A.; Solymossy, P. 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780935. (CONF-8409215—Absts.).

From 6. Hungarian conference on biomedical engineering and 2. IMEKO conference on measurement in clinical medicine; Balatonfuered, Hungary (18 Sep 1984).

Published in summary form only.

40219 (INIS-mf—9477, pp 110-111) **Thermoluminescent dosimetry in radiation therapy.** Nagy, A.B.; Szabo, Z. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780935. (CONF-8409215—Absts.).

From 6. Hungarian conference on biomedical engineering and 2. IMEKO conference on measurement in clinical medicine; Balatonfuered, Hungary (18 Sep 1984).

Published in summary form only.

40220 (INIS-mf—9482, pp 9) **Automatic gamma counter NA 3601.** Broj, K.; Dvorak, V.; Martinek, J.; Temml, P.; Tuma, Z.; Markova, H. (Tesla, Premysleni (Czechoslovakia). Vyzkumny Ustav Pristroju Jaderne Techniky); Rejlek, J.; Svaty, Z. (Tesla, Liberec (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

40221 (JAERI-M—84-010, pp 231-250) **Accuracy and precision of dosimetry required for radiotherapy and atomic, molecular and nuclear data affected on accuracy.** Onai, Yoshio (Japanese Foundation for Cancer Research, Tokyo. Cancer Inst.). Mar 1984. (In Japanese). JAERI-Tokai-Mura, Naka-gun, Ibaraki-ken, 319-11, Japan. File Number TI84901547. (CONF-8311187—; NEANDC(J)—97/AU; INDC(JPN)—84/G).

From JAERI seminar on nuclear data; Tokai, Japan (30 Nov 1983).

The occurrence of normal tissue complications and probability of tumor control are steep functions of absorbed dose. It has been recommended, therefore, that the delivery of the dose to the patient should be performed with a precision better than +-2% and an overall uncertainty less than +-5%. This paper describes the sequence of dosimetry procedures to deliver the absorbed dose to the patient and the method of determining absorbed dose for x-ray, electron and neutron therapy. The uncertainties of physical parameters involved in dosimetry are discussed.

40222 (LBL—18951) High energy beam transport system for a Heavy Ion Medical Accelerator. Renner, T.R.; Chu, W.T.; Gough, R.A.; Staples, J.; Tanabe, J. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—223). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015272.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

A beam transport system for a Heavy Ion Medical Accelerator is presented. The design allows for ease of tuning, similarity of tuning between different beam lines, and future expansion of the number of beamlines. An option for generating secondary beams with acceptable transmission losses to all treatment areas is also included in the design, as is a vertical beamline option for use with patients in a horizontal position. 3 refs., 5 figs., 3 tabs.

40223 (LBL—18952) Wobbler dosimetry for the biomedical program at the LBL Bevalac. Chu, W.; McEvoy, M.; Nyman, M.; Renner, T.; Gonzales, B.; Singh, R.P.; Stradner, R. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 6p. (CONF-850504—214). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015250.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

A system for measuring delivered dose and dose distributions has been developed for use with the wobbler beam delivery system. The system allows rapid termination of an irradiation when hardware of software monitors indicate the required dose has been delivered. In addition several safeguard systems are required by such an active system in event of a failure of the wobbler, associated electronic hardware or the computer. Computer graphic displays allow operator monitoring of the irradiation on a pulse by pulse basis. 1 ref., 5 figs.

40224 (LBL—18978) Medical heavy ion accelerator proposals. Gough, R.A. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 8p. (CONF-850504—236). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015247.

From Particle accelerator conference; Vancouver, Canada (13 May 1985).

For several decades, accelerators designed primarily for research in nuclear and high energy physics have been adapted for biomedical research including radiotherapeutic treatment of human diseases such as pituitary disorders, cancer, and more recently, arteriovascular malformations. The particles used in these treatments include pions, protons and heavier ions such as carbon, neon, silicon and argon. Maximum beam energies must be available to penetrate into an equivalent of about 30 cm of water, requiring treatment beams of 250 to 1000 MeV/nucleon. Certain special treatments of superficial melanoma, however, require that beam energies as low as 70 MeV/nucleon also be available. Intensities must be adequate to complete a 100 rad treatment fraction in about 1 minute. For most heavy ion treatments, this corresponds to 10^7-10^9 ions/second at the patient. Because this research is best conducted in a dedicated, hospital-based facility, and because of the clinical need for ultra-high reliability, the construction of new and dedicated facilities has been proposed. Heavy ion accelerators can provide a variety of ions and energies, permitting treatment plans that exploit the properties of the ion best suited to each individual treatment, and that employ radioactive beams (such as ^{11}C and ^{19}Ne) to precisely confirm the dose localization. The favored technical approach in these proposals utilizes a conventional, strong-focusing synchrotron capable of fast switching between ions and energies, and servicing multiple treatment rooms. Specialized techniques for shaping the dose to conform to irregularly-shaped target volumes, while simultaneously sparing surrounding, healthy tissue and critical structures, are employed in each treatment room, together with the sophisticated dosimetry necessary for verification, monitoring, and patient safety. 3 refs., 8 figs.

40225 (LBL—19481) HISPET project: state-of-the-art. Del Guerra, A.; Lum, G.K.; Perez-Mendez, V.; Schwartz, G. (Lawrence Berkeley Lab., CA (USA); Pisa Univ. (Italy). Ist. di Fisica). Sep 1984. Contract AC03-76SF00098. 10p. (CONF-850169—15). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014540.

From 7. international conference on positron annihilation; New Delhi, India (6 Jan 1985).

The state of the art of the HISPET project is presented: a HIgh Spatial resolution Positron Emission Tomograph based on MultiWire Proportional Chambers with lead-glass dense drift-space converters. HISPET will be capable of imaging three-dimensional distributions of a positron emitting radioisotope within a typical volume of 3 liters. It will have a volume sensitivity of ~100,000 c/s per 0.1 μ Ci/ml, a signal to noise (true to accidental coincidences) ratio of 3:1 and an intrinsic spatial resolution of less than 4.5 mm (FWHM).

40226 (NPL-RS—51) Radionuclide usage survey 1979-80. Final report. Woods, M.J. (National Physical Lab., Teddington (UK)). Aug 1980. 23p. (ICRM-LSWG—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701873.

Report of the International Committee for Radionuclide Metrology, Life Sciences Working Group.

Details of a survey by the Life Sciences Working Group of the International Committee for Radionuclide Metrology (ICRM) on radionuclide usage by medical physicists in 11 countries are presented. The results indicate that the radionuclide which will be of most significance in the future will be F-18, Fe-52, Ga-67, Ga-68, Kr-81m, Tc-99m, In-111, I-123, Xe-127 and Tl-201.

40227 (PB—85-190908/XAB) Principles of radioimmunoassay. Immunology Series No. 12. George, J.R.; Palmer, D.F.; Cavallaro, J.J.; Wagner, W.M. (Centers for Disease Control, Atlanta, GA (USA). Program Office). Sep 1984. 225p. NTIS MF A01.

The text is designed to enable the student to learn the basic principles of radioimmunoassay and their practical application. These principles include ancillary subject matter such as radiation physics and statistics which are essential to understanding the test, establishing quality control, and working safely in the radioimmunoassay laboratory. Emphasis is placed upon the practical aspects of radioimmunoassay that are of interest to radioimmunoassay workers, from the technician to the supervisor.

40228 Pancreas accumulation of radioiodinated HIPDM in mice and rats. Yamamoto, K.; Som, P.; Srivastava, S.C.; Meinken, G.E.; Brill, A.B. (Brookhaven National Lab., Upton, NY). *Journal of Nuclear Medicine;* **26**: No. 7, 765-769(Jul 1985). Contract AC02-76CH00016.

High pancreatic affinity for ^{131}I-labeled HIPDM was observed in mice and rats. Although the brain uptake of [^{131}I]HIPDM is very fast, the pancreatic uptake is rather slow. The pancreas to liver ratios are higher than those obtained with routinely used pancreatic agent [^{75}Se]selenomethionine. An increase in liver uptake and decrease in pancreatic uptake was observed at higher dose of carrier HIPDM, which resulted in lower pancrease to liver ratios. HIPDM is a new type of compound which shows predilection for pancreas. Our results suggest that [^{123}I]HIPDM might be a useful agent for pancreas imaging.

40229 Determination of clinical efficacy: nuclear medicine as applied to lung scanning. Saenger, E.L.; Buncher, C.R.; Specker, B.L.; McDevitt, R.A. (Univ. of Cincinnati, OH). *Journal of Nuclear Medicine;* **26**: No. 7, 793-806(Jul 1985). Contract AC02-77EV04533.

This paper describes a Society of Nuclear Medicine sponsored study of 2023 patients which compares two methods, logistic regression (LR) and entropy minimax pattern detection (EMPD), to evaluate efficacy. Lung scans, used in determining or excluding a diagnosis of pulmonary embolism (PE), were utilized to create the data set. The LR analysis, presented here, shows that lung scan findings have significant influence on the referring physician's diagnostic thinking. Models were developed for the probability of a signout diagnosis of PE, and equal patient groups tested the validity of

these regression equations. A comparison of the sensitivity, specificity, and predictive values of EMPD and LR was done. EMPD predicts a signout diagnosis on only 41% of cases before lung scan and 71% after lung scan; LR provides a prediction of the signout diagnosis on 100% of cases. An advantage of EMPD is that it does not require poor probability estimates.

40230 **Application of an information-theoretic method for efficacy assessment.** Gift, D.A.; Schonbein, W.R.; Saenger, E.L.; Potchen, E.J. (Michigan State Univ., East Lansing). *Journal of Nuclear Medicine;* **26**: No. 7, 807-811(Jul 1985). Contract AC02-77EV04533.

An information-theoretic pattern recognition method was used to construct descriptive models of data related to 1674 radioisotope lung scan referrals for the purpose of assessing lung scan influence on diagnosis and management of pulmonary embolism. It was observed that, relative to other clinical information available prior to the scan, the lung scan significantly improved the ability of the models to predict diagnostic and management outcomes, implying that the lung scan has significant influence on these clinical decisions.

40231 **Nuclear resonance scattering measurement of human iron stores.** Wielopolski, L.; Ancona, R.C.; Mossey, R.T.; Vaswani, A.N.; Cohn, S.H. (Brookhaven National Laboratory, Medical Research Center, Upton, New York 11973). *Medical Physics;* **12**: No. 4, 401-404(Jul 1985). Contract AC02-76CH00016.

Hepatic iron stores were measured noninvasively in 31 patients (thalassemia, hemodialysis, hemosiderosis, refractory anemia) with suspected iron overload, employing a nuclear resonance scattering (NRS) technique. The thalassemia patients were undergoing desferrioxamine chelation therapy during the NRS measurements. The hemodialysis patients were measured before chelation therapy. Iron levels measured by NRS were in general agreement with those determined in liver biopsies by atomic absorption spectroscopy. In addition, NRS measurements from the thorax of some of these patients suggest that this method may also prove useful for clinical assessment of cardiac iron.

5507 Microbiology

REFER ALSO TO CITATION(S) 38983, 40204

40232 **β-xylosidase of Thermomonospora.** Ristroph, D.L.; Humphrey, A.E. (Univ. of Pennsylvania, Philadelphia). *Biotechnology and Bioengineering;* **27**: No. 6, 909-913(1985). Contract AC02-76ET20025.

This study is concerned with characterizing cell-bound inducible β-xylosidase produced by a strain of the thermophilic bacterial genus Thermomonospora. A crude preparation of this enzyme recovered from sonicated cells of this organism displayed high activity against paranitrophenyl-β-xylopyranoside over a pH range of 5.5-7.7. The temperature optimum, based on a 30-min assay of activity, at pH 6.5 was 70°C. The crude enzyme had a thermal half-life of approximately 1 week at 55°C and pH 6.5 Xylose inhibited the enzyme. Values of K/sub m/ and V/sub max/ are estimated from the reaction rate data as 0.82 mM and 8 U/L, respectively.

5508 Morphology

40233 **(CONF-8409198—1) Differential expression of murine adult hemoglobins in early ontogeny.** Wawrzyniak, C.J.; Lewis, S.E.; Popp, R.A. (Tennessee Univ., Oak Ridge (USA). Graduate School of Biomedical Sciences; Research Triangle Inst., Research Triangle Park, NC (USA). Chemistry and Life Sciences Div.; Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 19p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85005364.

From Conference on hemoglobin switching; Airlie, VA, USA (30 Sep 1984).

A hemoglobin mutation is described that permits study of the expression of the two adult β-globin genes throughout fetal and postnatal development. Mice with a mutation at the Hbb/sup s/, β-globin locus, were used to study the relative levels of β-s2major and β-sminor globins specified by the mutant Hbb/sup s2/ haplotype during development. At 11.5 days of gestation β-sminor comprised over 80% and β-s2major under 20% of the adult beta-globin. The relative level of β-sminor decreased through fetal development; at birth β-sminor represented 33.7% of the β-globin. The adult values of 71.0% β-s2major and 29.0% β-sminor globin are expressed in mice six days after birth. Because the two β-globin genes are expressed in mice of the Hbb/sup 2s/ haplotype, both the β-smajor and β-sminor genes must be expressed in mice of the Hbb/sup s/ haplotype. Expression of the β-sminor gene is elevated to 35.6% in Hbb/sup s2/ mice that have been bled repeatedly. Thus, the 5' β-s2major and 3' β-sminor genes of the Hbb/sup s2/ haplotype and, presumably the 5' β-smajor and 3' β-sminor genes of the Hbb/sup s/ haplotype, are regulated independently and are homologous to the 5' β-dmajor and 3' β-dminor genes of the Hbb/sup d/ haplotype. Mice of the Hbb/sup s2/ haplotype are better than mice of the Hbb/sup d/ haplotytpe for studying the mechanisms of hemoglobin switching because the Hbb/sup s2/ each of the three embryonic and two adult hemoglobins can be separated by electrophoresis. 17 refs., 3 figs.

5509 Pathology

40234 **(INIS-mf—9646, pp 54-55) Application of electron diffraction to crystal identification in pathologic tissues.** Reid, A.D.; Cheng, P.T.; Grynpas, M.D.; Pritzker, K.P.H. (Mount Sinai Hospital, Toronto, Ontario (Canada)). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

40235 **(LA-UR—85-1525) Biologic response to complex blast waves.** Richmond, D.R.; Yelverton, J.T.; Fletcher, E.R.; Phillips, Y.Y. (Los Alamos National Lab., NM (USA); Walter Reed Army Inst. of Research, Washington, DC (USA). Dept. of Respiratory Research). 1985. Contract W-7405-ENG-36. 21p. (CONF-850976—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012694.

From 9. international symposium on military applications of blast simulation; Oxford, UK (23 Sep 1985).

Small, bare charges were detonated inside an M59 armored personnel carrier (APC) in an attempt to simulate the complex blast waves generated by the jets from shaped-charge warheads penetrating into armored vehicles. Anesthetized sheep were placed inside the APC at 92- and 122-cm ranges from 57- or 113-g pentolite charges. Pressure-time was measured by pressure transducers either mounted on the animals or free standing at comparable ranges on the opposite side of the vehicle. In general, the waveforms were characterized by an initial shock wave of less than 1-msec duration followed by repeated reflections of decreasing magnitude. No deaths nor lung hemorrhages were observed, but all the animals sustained severe ear injury. Animals subjected to peak overpressures of 1.2 to 2.3 bar from the 113-g explosions also received slight non-auditory blast injuries to the upper respiratory and gastrointestinal tracts; those exposed to peak overpressures of just under 1 bar from the 57-g charges did not. The non-auditory blast injuries inside the APC were more severe than those sustained by sheep at comparable distances from 113-g charges in the open. The results suggested that the biological consequences of a complex wave of the type encountered in this study can be equated approximately to a Friedlander wave with a peak overpressure equal to that of the complex wave and with a total impulse equal to the impulse over the first 2 to 3 msec of the complex wave. 9 refs., 7 figs., 1 tab.

5510 Physiological Systems

REFER ALSO TO CITATION(S) 40234

40236 **(INIS-mf—9573-Vol.2) International training course on the use of radiation and isotopic techniques in soil-plant relationships, 3 November-11 December 1981.** (Instituto Nacional de Investigaciones Nucleares, Mexico City; International Atomic Energy Agency, Vienna (Austria)). 1981. 142p. (In Spanish). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781409.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Items within the scope of EDB have been entered individually into the data base. (ACR)

40237 **(INIS-mf—9573-Vol.5) International training course on the use of radiation and isotopic techniques in soil-plant relationships, 3 November-11 December 1981.** (Instituto Nacional de Investigaciones Nucleares, Mexico City; International Atomic Energy Agency, Vienna (Austria)). 1981. 86p. (In Spanish). NTIS (US Sales Only), PC A05/MF A01. File Number DE85781440.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Items within the scope of EDB have been entered individually into the data base. (ACR)

40238 (INIS-mf—9645, pp 10-11) **Applications of electron probe x-ray analysis in pathology.** Ghadially, F.N. (Saskatchewan Univ., Saskatoon (Canada). Univ. Hospital). 1982. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781446. (CONF-8206275—).

From 9. annual meeting of the Microscopical Society of Canada; Edmonton, Alberta, Canada (11 Jun 1982).

Summary.

40239 (INIS-mf—9646, pp 52-53) **Can the S.T.E.M. ratio technique be useful for imaging unstained biological specimens.** Egerton, R.F. (Alberta Univ., Edmonton (Canada). Dept. of Physics). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

5520 Public Health

REFER ALSO TO CITATION(S) 40316

5530 Agriculture And Food Technology

REFER ALSO TO CITATION(S) 40163, 40164, 40165, 40203, 40279, 40280, 40282, 40286, 40294, 40295

40240 (IAEA-TECDOC—306, pp 37-46) **Bound residues of ^{14}C-chlorfenvinphos in winter rape and soil.** Dec, J.; Czaplicki, E.; Giebel, J. (Institute for Plant Protection, Poznan (Poland)). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

The binding properties of chlorfenvinphos were studied by application of ^{14}C-chlorfenvinphos to the leaves and stems of winter rape and two loamy sand soils of different organic matter content. After application of vinyl-^{14}C-chlorfenvinphos to the plants at a dosage of 0.3 mg/plant, no bound radioactivity was detected either in the flowers and siliques or in the roots. In the leaves and/or stems, the bound ^{14}C-residues, expressed as chlorfenvinphos, ranged from 0.02 μg/g one hour after the treatment to 0.18 μg/g at harvest. Repeated treatment applied to the plants 9 days after the first application caused no increase of the bound residue concentration. Various treatments of stem-bound ^{14}C with alkali and acid led to release of some radioactivity. When vinyl-^{14}C-chlorfenvinphos was applied to the soils, the bound ^{14}C-residues increased and the extractable ^{14}C-residues decreased with time, particularly in the soil of higher organic matter content. After 114 days, the bound ^{14}C-residues, expressed as percentage of the applied ^{14}C, amounted to 13.7% in the soil of higher and 11.2% in the soil of lower organic matter content. When soil was treated with ring-^{14}C-chlorfenvinphos, the bound and extractable ^{14}C-residues were somewhat higher than those determined for vinyl label. Experiments suggested that binding was related to the activity of soil microorganisms since soil sterilization resulted in a reduction of bound ^{14}C-residues by 80% (vinyl label) and 79% (ring label).

40241 (IAEA-TECDOC—306, pp 47-52) **Bound residues of isoprocarb in the components of the rice ecosystem.** Magallona, E.D. (National Crop Protection Center, Coll. of Agriculture, University of the Philippines at Los Banos, College, Laguna). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

Aspects relating to the binding of isoprocarb in paddy soil were investigated. Stirring did not affect the loss of pesticide from water. Extractable isoprocarb in soil increased and leveled off at 10 to 15 days, decreasing thereafter. The distribution coefficient of isoprocarb in soil and water further supports the possibility of bound residue formation.

40242 (IAEA-TECDOC—306, pp 53-55) **Possible uptake of methomyl by bean plants.** Mostafa, I.Y. (Middle Eastern Regional Radioisotope Centre for the Arab Countries, Cairo (Egypt)). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

The bioavailability to bean plants of ^{14}C-labelled methomyl applied to Egyptian soil has been investigated, using four different application rates. The amounts of radioactivity in bean plants were found to depend on pesticide concentration as well as on the time of plant growth. In general, the amounts detected in roots were significantly higher than those found in shoots.

40243 (IAEA-TECDOC—306, pp 57-66) **Persistence of paraquat in the soil and observations with other herbicides relevant to the theme of bound residues.** Hance, R.J.; Byast, T.H. (Agricultural Research Council, Weed Research Organization, Yarnton, Oxforshire (UK)). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

Results from three separate experiments that have some relevance to bound residues are reported. In the first, ^{14}C-labelled paraquat was lost when applied to soil in the field, about 26% of the radioactivity disappearing in 15 months, whereas in laboratory incubation studies there was no loss of radioactivity in one year. Two possible explanations are (i) that there was photolytic decomposition in the field, (ii) the preparation of the soil for the laboratory study upset the microbial ecology of the soil to the detriment of organisms that can degrade paraquat. In an experiment with ^{14}C-labelled isoproturon, there was an indication that there was slightly more ^{14}C in the unextractable humin fraction in soil in which wheat plants were grown than in bare soil. Work in the UK, Federal Republic of Germany and in Switzerland has shown that the phytotoxicity of residues of atrazine, carbetamide, chloridazone, propyzamide, simazine, lenacil, monolinuron, linuron, propachlor and methabenzthiazuron can be satisfactorily predicted on the basis

of the amount that is extractable with water. This implies that bound residues of these compounds, if they exist, are unlikely to be phytotoxic.

40244 (IAEA-TECDOC—306, pp 67-89) **Formation and fate of bound residues of benzene-^{14}C and its chlorinated derivatives in soil and plants.** Klein, W.; Scheunert, I.; Topp, E.; Schmitzer, J. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Inst. fuer Oekologische Chemie). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

Outdoor experiments with hexachlorobenzene-^{14}C, pentachlorobenzene-^{14}C, 1,2,4-trichlorobenzene-^{14}C, and benzene-^{14}C in soil-crop-systems indicate that the formation rate of bound residues in soil and plants, expressed as bound residues in percent of total residue in the sample, decreases with increasing number of chlorine in the molecule, which is parallel to increasing resistance to chemical and biological degradation. The time-course of formation and fate of bound residues in soil and plants is characterized by a very slow decrease of residue levels in soil with time, indicating that biodegradation of bound residues hardly exceeds their re-formation from the parent compound during one vegetation period, and by a steep decrease of residue levels in plants, which, however, might be due rather to the "dilution" of residues by plant growth which offsets the small uptake from soil in later growth stages, than to biodegradation. The portion of bound residues as compared to the total residue increases with time, indicating that bound residues are more persistent than the parent compounds and their soluble metabolites; an exception for this observation is benzene. Cress plants, in general, contain less bound residues than barley plants, both in terms of concentration and in terms of percentage of total residue. Again, benzene is an exception; fast biological conversion in soil and plants to metabolites with other properties may be one reason for this exceptional behaviour. In deeper soil layers, soil-bound residues occur also. For the chemical group tested here, the ratio between bound and extractable residues does not differ to a larger extent between the soil layers.

40245 (IAEA-TECDOC—306, pp 91-105) **Fate of dieldrin in radishes.** Stratton, G.D. Jr.; Wheeler, W.B. (Florida Univ., Gainesville (USA). Inst. of Food and Agricultural Sciences). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

^{14}C-dieldrin (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1, 4-endo-exo-5,8-dimethanonaphthalene) was applied in a commercial dieldrin formulation to the roots and surrounding soil of early mature radishes, maintained in environmental growth chambers, at rates of 1.1 and 11.1 kg/ha. Edible portions of the radishes were sampled 1, 7, 14 and 21 days post application. ^{14}C residues (as dieldrin equivalents) present in the 1.1 kg/ha treatment ranged from 0.4-2.1 ppm, and in the 11.1 kg/ha treatment from 4.0-8.5 ppm. Extractable ^{14}C was primarily dieldrin (77-94%) and photodieldrin (2.7-10.4%). The concentration of unextractable ^{14}C increased with time for both treatments (0.11-0.96 ppm). Much of the bound ^{14}C was released by acid hydrolysis of the solvent extracted tissue. Radiocarbon associated with lignin remained relatively constant for the 1, 7 and 14 day post application periods (approximately 0.02 ppm), but a large increase occurred between 14 and 21 days (approximately 0.27 ppm). Dieldrin (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1, 4-endo-exo-5,8-dimethanonaphthalene) is a chlorinated hydrocarbon insecticide which was registered for use in the United States as an insecticide. It is considered to be relatively persistent in the environment and is not metabolized extensively by plants or animal enzyme systems.

40246 (IAEA-TECDOC—306, pp 107-115) **Bound residues of ^{14}C-lindane in rice plants and soil.** Raghu, K.; Ferreira, J. (Bhabha Atomic Research Centre, Bombay (India). Biology and Agriculture Div.). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

The extractable ^{14}C-residues decreased with time in both unflooded (upland) and flooded (low land) ^{14}C-gamma HCH treated soils. In both unflooded and flooded soils, considerable amounts of ^{14}C-bound residues were formed. Partially bound residues could be detected after 90 and 120 days in unflooded soils. A considerable amount was detected as volatile residues. Addition of green manure lowered bound residue formation and volatilization. The ^{14}C-residues were incorporated in fulvic and humic acid fractions of soil organic matter. Although no significant residues were left in rice, husk or straw samples of ^{14}C-HCH treated rice plants, the bound residue formation in rice straw may become important if bioavailable.

40247 (IAEA-TECDOC—306, pp 117-122) **Residues of endosulfan in tomato.** El-zorgani, G.A.; Abdalla, A.M.; Kisha, J. (Agricultural Research Corp., Wad Medani (Sudan)). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

The fate of endosulfan in tomato leaves, fruits and its uptake by seedlings from nutrient solution was studied using ^{14}C-endosulfan ($\alpha+\beta$). The compound was found to disappear rapidly from leaf surface with a half-life of 6-7 days. Approximately 20% of the applied activity was detected inside the leaves and was extracted most effectively with hexane/ethanol mixture. Endosulfan sulfate and endosulfan alcohol were found only in the internal leaf extracts. On incubating α- and β-isomers separately in ripening on-plant tomato fruits for 24 hr., over 95% of the radioactivity was recovered by methanol extraction. However, about 3% of radioactivity remained non-extractable in the cake. Uptake of radioactive endosulfan by seedlings over a 4-day period reached up to 7% of activity in the medium.

40248 (IAEA-TECDOC—306, pp 123-132) **Persistence of atrazine and its metabolites in soil eight years after a single herbicide application and their uptake by oat plants.** Capriel, P.; Haisch, A. (Bayerische Landesanstalt fuer Bodenkultur und Pflanzenbau, Muenchen (Germany, F.R.)). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

The fate of atrazine in soil was investigated under field conditions. In spring 1973 the soil was treated with ^{14}C-ring-labeled atrazine and cultivated with various plant species each year. In summer 1981 soil samples were collected and analysed. The soil still contained about 83% of the total initially applied ^{14}C-activity. From this only 40% could be extracted and analysed. Besides traces of atrazine six metabolites were further identified which originated from the parent compound through N-dealkylation and hydrolysis. The soil containing only bound (non extractable) ^{14}C-residues was fractionated into humin, humic acid and fulvic acid fractions. The distribution of the residual ^{14}C-activity was: 54%, 11% and 35%, respectively. The soil in the culture boxes was sowed with oats in May of 1982. In August the oats were harvested and analysed. The uptake amounted to 0.03% of the total initially applied ^{14}C-activity. 2-Hydroxy-4-amino-6-isopropylamino-s-triazine and 2-hydroxy-4-ethylamino-6-amino-s-triazine were identified in conjugated form in the extractable part.

40249 (IAEA-TECDOC—306, pp 133-147) **Formation of bound residues of (ring-^{14}C) simazine in a Parabraunerde (Alfisol) and their availability to maize.** Kloskowski, R.; Fuehr, F. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Radioagronomie). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

(Ring-^{14}C) simazine was incubated in a Parabraunerde (Alfisol) at 22-C and 65% of the maximum water holding capacity of the soil for 108 days. The $^{14}CO_2$-evolution was registered and soil samples were extracted at day 1, 37, 78 and 108 employing 0,2 M ascorbic acid, 0,2 M citric acid and acetone (1:1:2) to study the metabolite spectra and the formation of bound residues in the soil. In specially developed experimental pots the bioavailability of the bound residue fraction was studied using maize plants. Within 30 days 20% of the applied radioactivity was taken up via the roots and predominantly translocated to the shoots when /ring-^{14}C/simazine was added to the soil immediately before the plant experiment. This radioactivity fraction decreased to 10% when the maize was grown in soil containing aged simazine residues after 108 days of degradation. If the soil contained only bound residues, produced as described above, only traces of radioactivity (0,08% of the applied radioactivity) became bioavailable to roots. A desorption study with water reflected the relative bioavailability of the residues in the soil.

40250 (IAEA-TECDOC—306, pp 149-165) **Further studies on the bound pesticide residues in soil and plants.** Khan, S.U. (Research Branch, Chemistry and Biology Research Inst., Agriculture Canada, Ontario). Apr 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85781282. (CONF-8307152—).

From Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food; Neuherberg, F.R. Germany (11 Jul 1983).

The data presented in this paper demonstrate that the various physiological groups of microbes used in this study have the enzymatic and/or biological potential to release bound pesticide residues from soil. The release was not influenced by the nature of the microbial population present, thereby indicating that the process involved cometabolism or that the residues are bound in various matrices, or both. Our studies also indicate that the in vitro incubation of chicken liver homogenate with plant tissues containing bound ^{14}C residues released and metabolized some of these residues. However, no apparent release of ^{14}C residues was observed when the incubation involved rumen liquor. It appears that in the liver homogenate incubation system, bound 2-chloro dealkylated metabolites in the plant tissues were released and subsequently metabolized to 2-hydroxy analogues.

40251 (INIS-mf—9573-Vol.1) **International training course on the use of the radiation and isotopic techniques in soil-plant relationships, 3 November-11 December 1981.** (Instituto Nacional de Investigaciones Nucleares, Mexico City; International Atomic Energy Agency, Vienna (Austria)). 1981. 190p. (In Spanish). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781445.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Individual papers are separately indexed. (LEW)

40252 (INIS-mf—9573-Vol.3, pp 402-430) **Determination of photosynthesis activity by means of $^{14}CO_2$.** Sebastianelli, A. (International Atomic Energy Agency, Vienna (Austria)); Fernandez Gonzalez, J. (Junta de Energia Nuclear, Madrid (Spain)). 1981. (In Spanish). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781444.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Techniques are discussed for ^{14}C utilization in determining amounts of carbon assimilated by plants in the photosynthetic process.

40253 (INIS-mf—9573-Vol.3, pp 431-457) **Fertilizer evaluation of phosphate rock by radioactive tracer techniques.** Zapata, F. (International Atomic Energy Agency, Vienna (Austria)). 1981. (In Spanish). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781444.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

A radioisotopic tracer technique was used to evaluate the agronomical efficiency of phosphate rock fertilizers considering mineral, soil and crop characteristics and conditions.

40254 (INIS-mf—9573-Vol.3) **International training course on the use of radiation and isotopic techniques in soil-plant relationships, 3 November-11 December 1981.** (Instituto Nacional de Investigaciones Nucleares, Mexico City; International Atomic Energy Agency, Vienna (Austria)). 1981. 199p. (In Spanish). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781444.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Individual papers are indexed separately. (LEW)

40255 (INIS-mf—9573-Vol.4, pp 506-523) **^{15}N labelled tracer techniques used in the quantitative measurement of nitrogen absorption in wheat crops.** Zapata, F. (International Atomic Energy Agency, Vienna (Austria)). 1981. (In Spanish). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781451.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

The amounts of fertilizer derived nitrogen absorbed in soil and in the stalks and roots of wheat crops are quantified by isotopic techniques.

40256 (INIS-mf—9573-Vol.4, pp 525-579) **^{15}N-labelled tracer techniques-analytical techniques.** Sebastianelli, A. (International Atomic Energy Agency, Vienna (Austria)). 1981. (In Spanish). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781451.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Examined are some basic analytical concepts in the utilization of the ^{15}N isotope in tracer techniques using spectrophotometric analysis.

40257 (INIS-mf—9573-Vol.4, pp 580-593) **Some basic concepts on the ^{15}N isotope.** Zapata, F. (International Atomic Energy Agency, Vienna (Austria)). 1981. (In Spanish). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781451.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Examined are some basic chemical and stoichiometrical concepts in the utilization of the ^{15}N isotope.

40258 (INIS-mf—9573-Vol.4, pp 632-655) **Isotopic techniques in quantitative determinations of biologically fixed nitrogen.** Zapata, F. (International Atomic Energy Agency, Vienna (Austria)). 1981. (In Spanish). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781451.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Nitrogen fixation from labelled nitrogen sources transferred to soils and absorbed by legumes is measured.

40259 (INIS-mf—9573-Vol.4, pp 656-688) **Isotopic techniques in studies of soil fertility and minerals as plant nutrients.** Zapata, F. (International Atomic Energy Agency, Vienna (Austria)). 1981. (In Spanish). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781451.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Isotopic labelling techniques for directly and quantitatively determining plant nutrient absorption are studied.

40260 (INIS-mf—9573-Vol.4) **International training course on the use of radiation and isotopic techniques in soil-plant relationships, 3 November-11 December 1981.** (Instituto Nacional de Investigaciones Nucleares, Mexico City; International Atomic Energy Agency, Vienna (Austria)). 1981. 183p. (In Spanish). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781451.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Items within the scope of EDB have been entered individually into the data base. (ACR)

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

REFER ALSO TO CITATION(S) 39247, 39330, 40045, 40117, 40914

40261 (AECL—6797-Rev.1) **Radiation effects on living systems. A bibliography of AECL publications.** Hawley, N.J. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Apr 1984. 51p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701627.

This bibliography includes papers and reports by Atomic Energy of Canada Limited scientists concerning radiation effects on living systems. It is divided into three sections: Radiobiology, Radiation Biochemistry and Radiation Chemistry. It is intended that the bibliography will be updated regularly.

40262 (CEGB-TPRD/B—0459/N84) **Distribution of radiation doses of classified workers in the Central Electricity Generating Board in 1982.** Mill, A.J.; Freck, S.E. (Central Electricity Generating Board, Berkeley (UK). Berkeley Nuclear Labs.). Jun 1984. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701877.

The annual doses received by classified radiation workers on six nuclear power stations in 1982 have been analysed. As previously observed the distribution of doses could be well described by a three-parameter log-normal distribution in which the third parameter is an effective dose limit. The median dose not exceeded by 50% of workers was 0.94 mSv and the mean dose was 1.63 mSv. The distribution has an effective limit of 14 mSv. This distribution of radiation doses is rather better than considered acceptable by the ICRP.

40263 (CEGB-TPRD/B—0460/N84) **Analysis of annual dose distributions for radiation workers.** Mill, A.J. (Central Electricity Generating Board, Berkeley (UK). Berkeley Nuclear Labs.). May 1984. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701878.

The system of dose limitation recommended by the ICRP includes the requirement that no worker shall exceed the current dose limit of 50mSv/a. Continuous exposure at this limit corresponds to an annual death rate comparable with 'high risk' industries if all workers are continuously exposed at the dose limit. In practice, there is a distribution of doses with an arithmetic mean lower than the dose limit. In its 1977 report UNSCEAR defined a reference dose distribution for the purposes of comparison. However, this two parameter distribution does not show the departure from log-normality normally observed for actual distributions at doses which are a significant proportion of the annual limit. In this report an alternative model is suggested, based on a three parameter log-normal distribution. The third parameter is an "effective dose limit" and such a model fits very well the departure from log-normality observed in actual dose distributions.

40264 (CONF-850473—4) **Metabolism and gastrointestinal absorption of neptunium and protactinium in adult baboons.** Ralston, L.G.; Cohen, N.; Bhattacharyya, M.H.; Larsen, R.P.; Ayres, L.; Oldham, R.D.; Moretti, E.S. (New York Univ., NY (USA). Inst. of Environmental Medicine; Argonne National Lab., IL (USA)). 1985. Contract AC02-76EV03382;W-31-109-ENG-38. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015414.

From Seminar on the speciation of fission products in the environment; Oxford, UK (16 Apr 1985).

The metabolism of neptunium and protactinium was studied in adult female baboons following intravenous injection and intragastric intubation. Immediately following intravenous injection (10^{-1} to 10^{-10} mg Np per kg body wt), neptunium cleared rapidly from blood, deposited primarily in the skeleton (54 +- 5%) and liver (3 +- 0.2%), and was excreted predominantly via urine (40 +- 3%). For the first year post injection, neptunium was retained with a biological half-time of ~100 days in liver and 1.5 +- 0.2 yr in bone. In comparison, injected protactinium (10^{-9} mg/kg) was retained in blood in higher concentrations and was initially eliminated in urine to a lesser extent (6 +- 3%). In vivo measurements indicated that protactinium was retained in bone (65 +- 0.3%) with a half-time of 3.5 +- 0.6 yr. Differences in the physicochemical states of the neptunium or protactinium solutions injected did not alter the metabolic behavior of these nuclides. The gastrointestinal absorption value for neptunium in two fasted baboons, sacrificed at 1 day post administration, was determined to be 0.92 +- 0.04%. Of the total amount of neptunium absorbed, 52 +- 3% was retained in bone, 6 +- 2% was in liver, and 42 +- 0.1% was excreted in urine. A method was developed to estimate GI absorption values for both nuclides in baboons which were not sacrificed. Absorption values calculated by this method for neptunium and protactinium in fasted baboons were 1.8 +- 0.8% and 0.65 +- 0.01%, respectively. Values for fed animals were 1 to 2 orders of magnitude less than those for fasted animals. 14 refs., 3 figs., 4 tabs. (DT)

40265 (DOE/ER—0225) **Centers for Disease Control review panel's recommendations on health effects and epidemiological studies of operations at the Savannah River Plant, Aiken, South Carolina. Public comment and meeting report.** (USDOE Office of Energy Research, Washington, DC. Office of Health and Environmental Research). May 1985. 246p. NTIS, PC A11/MF A01; 1; GPO Dep. File Number DE85015510.

Based on the request of the US Department of Energy, the Centers for Disease Control of the US Department of Health and Human Services organized a panel to review the feasibility and usefulness of conducting further epidemiologic studies of delayed health effects around the Department of Energy's Savannah River Plant. The review and recommendations of the panel were documented in a report entitled Epidemiologic Projects Considered Possible to Undertake in Populations Around the Savannah River Plant. On November 30, 1984, the Department of Energy announced in the Federal Register (49 FR 47095) the conduct of a public meeting and a 30-day public comment period between December 1 and December 30, 1984, on the recommendations of the review panel. Based on the requests of individuals and representatives of organizations attending the December 18, 1984, public meetings, the Department of Energy subsequently announced in the Federal Register on December 31, 1984 (49 FR 50767) an extension of the public comment period to January 31, 1985. This report documents the public meeting and comment process, and provides responses to the public comments that were submitted during this process. In addition, this report contains the Department of Energy's position based on the recommendations of the Centers for Disease Control review panel and the public comments. 23 refs., 16 tabs.

40266 **(DOE/EV/03380—40) Oncogenic action of ionizing radiation on rat skin. Progress report, February 1, 1984-January 31, 1985.** Burns, F.J. (New York Univ., NY (USA). Dept. of Environmental Medicine). 1985. Contract AC02-76EV03380. 21p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015963.

By studying the carcinogenic action of ionizing radiation on rat skin we hope to be able to develop plausible risk assessment strategies. 32 refs. (DT)

40267 **(DOE/EV/03382—17) Radioactivity studies. Progress report.** Wrenn, M.E.; Cohen, N.; Eisenbud, M. (New York Univ., NY (USA). Medical Center). 30 Jun 1978. Contract AC02-76EV03382. 82p. (COO—3382-17). NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85011808.

The annual report of M.E. Wrenn, N. Cohen and M. Eisenburg describing their research efforts on radionuclide kinetics of curium 243, curium 244 and americium 241 in baboons. Ancillary efforts in metabolic models, alpha dosimetry and environmental studies are also related. (DT)

40268 (DOE/EV/03382—17, pp I.1-I.9) **Analysis of / sup 243,244/Cm in soft tissues and skeleton of the adult baboon.** LoSasso, T.; Cohen, N.; Wrenn, M.E. 30 Jun 1978. NTIS, PC A05/MF A01. File Number DE85011808.

In Radioactivity studies. Progress report.

The distribution of curium 243 and curium 244 in the tissues of the adult baboon is reported from an experiment where animals were sacrificed seven months following a single IV exposure. One animal was treated with DPTA beginning 1 1/2 months following exposure. 2 refs., 3 tabs.

40269 (DOE/EV/03382—17, pp II.1-II.7) **In vivo measurements of /sup 243,244/Cm retention in the adult baboon.** LoSasso, T.; Cohen, N.; Wrenn, M.E. 30 Jun 1978. NTIS, PC A05/MF A01. File Number DE85011808.

In Radioactivity studies. Progress report.

The metabolism of /sup 243,244/Cm has been studied in four adult female baboons for periods of up to 2.2 years. The purpose of these experiments is to define the distribution and retention patterns of curium in the adult baboon. 2 refs., 2 figs.

40270 (DOE/EV/03382—17, pp III.1-III.16) **Metabolic studies of ^{241}Am in man: continued follow-up of a non-occupational contamination of a child and his father.** Cohen, N.; LoSasso, T.; Wrenn, M.E. 30 Jun 1978. NTIS, PC A05/MF A01. File Number DE85011808.

In Radioactivity studies. Progress report.

During the past eight years, sequential measurements have been made of the internal ^{241}Am body burdens of an adult male and his son who are estimated to have received initial exposures at the approximate ages of 50 and 4 years. Since ^{241}Am is a trivalent actinide which, upon becoming systemic, deposits primarily in the liver and on skeletal surfaces, the detectors were positioned in configurations. Measurements were made of ^{241}Am burdens in: (1) whole body; (2) thorax (lung); (3) liver; and (4) head (skeleton). Results of these measurements as determined from 1970 through 1977 are presented. For the whole body burden, when first measured in 1970, measured values for the man and his son represent 225 and 91% respectively of the occupational body burden of 40 nCi for an adult male. 10 refs., 5 figs., 3 tabs.

40271 (DOE/EV/03382—17, pp V.1-V.13) **Further developments on improved metabolic models for uranium metabolism in man.** Wrenn, M.E.; Lipsztein, J.; LoSasso, T.; Durbin, P.; Skrable, K. (Univ. of California, Berkeley; Univ. of Lowell, MA). 30 Jun 1978. NTIS, PC A05/MF A01. File Number DE85011808.

In Radioactivity studies. Progress report.

Two alternative mathematical approaches to solving the equations describing the uranium compartmental kinetics are described. One model consisted of a series of differential equations as described by Struxness to which is added a second long-term bone compartment. The other approach was developed in conjunction with Dr. Kenneth Skrable and consists of a refinement of his series of linear first order rate phenomena equations. This generalized solution has been developed using an approximation technique which again allows one to present the solutions in sufficiently simplified form that they may be programmed on a small calculator. 7 refs., 2 figs., 4 tabs.

40272 (DOE/EV/03382—17, pp VI.1-VI.3) **Cross-placental transfer of ^{241}Am in the baboon during late gestational pre-parturition.** Cohen, N.; LoSasso, T. 30 Jun 1978. NTIS, PC A05/MF A01. File Number DE85011808.

In Radioactivity studies. Progress report.

An adult female baboon in the latter stage of pregnancy was injected with ^{241}Am citrate in order to measure the cross-placental transfer of this nuclide. Levels of ^{241}Am activity were measured in the placenta and fetal tissues at 4 days after injection. The placenta and fetus contained approximately 3% and 0.6% of the injected dose, respectively. 2 refs., 1 tab.

40273 (DOE/EV/03382—17, pp VIII.1-VIII.8) **Measurement of nonhomogeneity of curium alpha irradiation in soft tissues of the baboon.** Steinhausler, F.; LoSasso, T.; Cohen, N. 30 Jun 1978. NTIS, PC A05/MF A01. File Number DE85011808.

In Radioactivity studies. Progress report.

A brief description of autoradiographic procedures for determining the spatial distribution of alpha tracks and localization of tissues is related. 2 refs., 3 figs.

40274 (DOE/EV/03382—17, pp IX.1-IX.4) **Studies on alpha track formation in cellulose nitrate solid state detectors using scanning electron microscopy.** Cohen, B.S.; Steinhausler, F.; Harley, N.H. 30 Jun 1978. NTIS, PC A05/MF A01. File Number DE85011808.

In Radioactivity studies. Progress report.

In a preliminary series of experiments, track etch film (Kodak Pathe LR 115) was exposed to alpha particles of different energies. Energy was varied by placing different absorbers between a plated ^{210}Po source and the film. 2 refs., 1 fig.

40275 **(DOE/EV/03382—23) Radioactivity studies. Progress report, April 30, 1984-June 1, 1985.** Cohen, N. (New York Univ., NY (USA). Inst. of Environmental Medicine). Jun 1985. Contract AC02-76EV03382. 99p. (COO—3382-23). NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85015288.

This report includes information pertaining to metabolic studies of neptunium and protactinium in the adult baboon. Recent investigations have provided additional data on the uptake, distribution, retention and excretion of Np-237, Np-239 and Pa-233 in baboons following single intravenous and gavage administrations. Data is also presented on the gastrointestinal absorption of isotopes of uranium, neptunium and plutonium in individual baboons after receiving multiple gavage administrations at selected time intervals and nutritional states. The gastrointestinal (GI) absorption (f_1 values) and retention factors have been calculated for each of these nuclides. We have begun metabolic studies on the adult tamarin (Saquinis labiatus). Data are presented in this report on the preliminary results of the metabolism of Np-239 bicarbonate intravenously injected into three females and one male tamarin. These data are discussed in comparison with similar results obtained with our baboons and with other species. 28 refs., 20 figs., 14 tabs.

40276 **(DOE/OR/00033—T153) Fast neutron depth dose distributions in a heterogeneous phantom.** Shonka, J.J. (Oak Ridge Associated Universities, Inc., TN (USA); Oak Ridge National Lab., TN (USA)). May 1978. Contract AC05-76OR00033;AC05-84OR21400. 118p. NTIS, PC A06/MF A01; GPO Dep. File Number DE85015019.

Thesis. Submitted to Georgia Institute of Technology, Atlanta.

A Monte Carlo code has been developed which can be used to calculate parameters of interest in the Reference Man series of phantoms. The code has been employed in calculations simulating the Rijswijk pre-clinical neutron therapy studies. Results obtained from the code for an A-P exposure of the left lung included the

adsorbed dose to various organs and the depth dose distribution, neutron spectra, and LET spectra. The neutron transport was taken from GTC and the gamma transport came from ALGAM. Cross sections used in the code were obtained from the GTC cross section library and the ENDF/BIV library. The Reference Man series of phantoms is derived from data in the recently published Reference Man report. Comparisons have been made with published results from Rijswijk as well as those of McGinley. Experimental measurements were made for four cases: a homogeneous soft tissue phantom and heterogeneous phantoms with soft tissue and lung, soft tissue and skeleton, and soft tissue with lung and skeleton, respectively. These measurements were made in a physical mockup of the Reference Man phantom using Lucite organs filled with equivalent substitutes for skeleton, lung, and soft tissue. These measurements used a small tissue-equivalent proportional counter, a tissue-equivalent ionization chamber, and an energy compensated G-M tube. From all techniques, total dose, LET, fast neutron dose and gamma dose were derived as a function of depth in the thoracic region. 73 refs., 23 figs., 10 tabs. (DT)

40277 **(EHD—83-104) Occupational radiation exposures in Canada, 1981.** Fujimoto, K.R.; Wilson, J.A.; Ashmore, J.P.; Grogan, D. (Department of National Health and Welfare, Ottawa, Ontario (Canada). Health Protection Branch). Dec 1983. 81p. NTIS (US Sales Only), PC A05/MF A01. File Number DE85701638.

French version included.

This report is the fourth in a series of annual reports on Occupational Radiation Exposures in Canada. The data is derived from the Radiation Protection Bureau's National Dose Registry which includes those records for radiation workers. The report presents average yearly doses by region and occupational category, dose distributions, and variation of average doses with time. Statistical data concerning investigations of high exposures reported by the National Dosimetry Services are included and individual cases are briefly summarized where the maximum permissible dose is exceeded. The decrease in the overall average doses established over the last 20 years appears to have resumed after an interruption during 1979 to 1980. A brief summary of extremity dose data is also included.

40278 **(IAEA-HPRA—11) Health physics research abstracts No. 11.** (International Atomic Energy Agency, Vienna (Austria)). Jul 1984. 165p. NTIS (US Sales Only), PC A08/MF A01. File Number DE85701879.

The present issue No. 11 of Health Physics Research Abstracts is the continuation of a series of Bulletins published by the Agency since 1967. They collect reports from Member States on Health Physics research in progress or just completed. The main aim in issuing such reports is to draw attention to work that is about to be published and to enable interested scientists to obtain further information through direct correspondence with the investigators. The attention of users of this publication is drawn to the fact that abstracts of published documents on Health Physics are published eventually in INIS Atomindex, which is one of the output products of the Agency's International Nuclear Information System. The present issue contains 235 reports received up to December 1983 from the following Member States. In parentheses the country's ISO code and number of reports are given.

40279 **(IAEA-R—2711-F) Elimination of Salmonella in froglegs by irradiation. Coordinated programme on factors influencing the utilization of food irradiation processes. Final report for the period 1 November 1980-31 October 1984.** Tambunan, P.R. (International Atomic Energy Agency, Vienna (Austria)). Nov 1984. 29p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701634.

Living frogs and their internal organs are highly contaminated with several serotypes of Salmonella. The high level of contamination was carried along with frog legs upon arrival at processing plants. Washing in chlorinated water and freezing reduced but did not eliminate Salmonella from the product. Irradiating frog legs artificially contaminated with Salmonella up to 10⁶/g before freezing showed that a dose of 3 kGy and above resulted in no detection of the bacteria. If irradiation was carried out after freezing, a dose of 4 kGy and above has to be used. The latter procedure appears to be more feasible commercially than the former one. It was concluded that a combination of chlorination, freezing and irradiation with a dose ranging from 3 to 6 kGy should provide sufficient conditions for elimination of Salmonella in the product. The treatment also results in lowering the total viable count to less than 500,000 cells/g to conform with the standard requirements for export.

40280 **(IAEA-R—2790-F) Storage properties of irradiated potatoes and onions. Part of a coordinated programme on the Asian Regional Cooperative Project on Food Irradiation. Final report for the period 1 December 1980 - 31 August 1984.** Hayashi, T. (International Atomic Energy Agency, Vienna (Austria)). Dec 1984. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701635.

Quality changes with regard to browning of inner buds and sprouting of irradiated onions variety Kitamiki and Ohotsuku were investigated. One ton of each variety was irradiated with either 38.1 or 65.2 Gy at the Commercial Potato Irradiator in Shihoro and stored either at 0 deg. C or 5 deg. C. After 6 months of storage, they were taken out to be stored at room temperature. It was observed that green inner buds developed in most unirradiated onions which showed no external sprouting irrespective of storage temperature. Irradiated onions showed no external or internal sprouting but exhibited browning of small inner buds. Unirradiated onions rooted slightly during storage at low temperature. None of the irradiated samples showed rooting. Neither of the samples spoiled significantly during storage. It was concluded that storage at room temperature accelerated sprouting and development of green inner buds of unirradiated onions and browning of small inner buds in irradiated ones. During off-seasons, only irradiated onions stored at low temperatures have qualities of commercial significance.

40281 **(IAEA-R—3264-F) Modification of radiosensitivity of mammalian cells by means of hyperthermia and chemical agent. Coordinated programme on improvement of cancer therapy by the combination of treatment by conventional radiation and physical or chemical means. Final report for the period 15 October 1982-14 October 1984.** Djordjevic, O. (International Atomic Energy Agency, Vienna (Austria)). Nov 1984. 21p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701628.

The effect of the treatment of the cultured mammalian cells with a relatively new anti-cancer drug teniposide (VM26), radiation (4 Gy), hyperthermia (42 deg. C and 45 deg. C) and caffeine, in various combinations, has been studied. The following conclusions can be drawn from the data obtained: The cultured mammalian cells respond to the anti-cancer drug VM26 treatment in a dose and time dependent manner. Significant potentiation of cell killing was demonstrated when they are exposed simultaneously to VM26 and hyperthermia. Post-treatment incubation of the cells in non-toxic concentration of caffeine (2 mM) has produced a marked potentiation of the lethal effect, indicating that caffeine interferes with the repair processes in these cells. Combination of VM26, hyperthermia and caffeine produced a maximum killing effect compared to VM26 treatment only. When the cells are exposed to initial (90 min. at 42 deg. C or 40 min. at 45 deg. C) and subsequent hyperthermia (60 min. at 42 deg. C or 60 min. at 45 deg. C) the thermotolerance will develop depending on the degree of initial and subsequent temperature. The combination of hyperthermia with irradiation results in a potentiation of the effect of treatment compared to the treatment with only irradiation or hyperthermia. Maximum killing of the cells will be obtained when irradiation is applied immediately after hyperthermia. The results obtained should be regarded as useful in case of clinical application of the tested agents.

40282 **(INIS-BR—250) Quince tree (cydonia oblonga Mill.)-breeding bases: seed propagation, cytogenetics and radiosensitivity.** Dall'Orto, F.A.C. (Sao Paulo Univ., Piracicaba (Brazil). Escola Superior de Agricultura Luiz de Queiroz). 1982. 167p. (In Portuguese). NTIS (US Sales Only), PC A08/MF A01. File Number DE85781449.

The following aspects of the marmeleiro, cydonia oblonga Mill., were researched: media nad periods to supply the seed chilling requirement in moist cold storage (5-10°c); quince seeds viability prepared by several extraction processes; seed germination and

seedling development; cytogenetic aspects; seeds viability influenced by storage conditions and periods of time for storage; preliminary determination of seed radiosensitivity; concentrations of some macro and micronutrients in quince seedlings obtained from irradiated seeds, and radiosensitivity and interphasic nuclear volumes.

40283 **(INIS-mf—9309) Studies on the radio-ecology of tritium in the city of Marburg and its surroundings in 1981: Radiation load of the population through body intake of tritium.** Hofmeier, J. (Marburg Univ. (Germany, F.R.). Fachbereich Humanmedizin). 19 Aug 1983. 61p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE85781450.

Tritium activity in the urine of occupationally non-exposed persons is established by means of screening tests computing the resulting whole-body dose and comparing the results with other values. Basic data are established in order to detect tritium exposure changes possibly obtaining after a certain period of time. It was noted that use of tritium in research and nuclear medecine does not result in an increased radiation load of the total population in a university city.

40284 (INIS-mf—9482, pp 18) **Practical applications of lyoluminescence.** Darickova, A. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia). Fakulta Jaderna a Fysikalne Inzenyrska). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

40285 (INIS-mf—9573-Vol.2, pp 227-236) **Ionizing radiation effects.** Ortiz Magana, R. (Comision Nacional de Seguridad Nuclear y Salvaguardias, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781409.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Described are some of the effects-stochastic, non-stochastic, somatic genetic or hereditary- of ionizing radiation.

40286 (INIS-mf—9573-Vol.3, pp 395-401) **Nuclear radiation detection by autoradiography.** Sebastianelli, A. (International Atomic Energy Agency, Vienna (Austria)). 1981. (In Spanish). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781444.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Autoradiography was used to study the distribution of a radioactive element throughout the plant or in some of its parts or organs.

40287 (INIS-mf—9644, pp 39-66) **Follow-up of irradiated human populations.** Myers, D.K. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). 1983. NTIS (US Sales Only), PC A08/MF A01. File Number DE85781436. (CONF-8211206—).

From Seminar on uranium and nuclear issues; Toronto, Ontario, Canada (2 Nov 1982).

This paper presents an overview of the usual population exposures to ionizing radiation, an assessment of the late effects of radiation by follow-up of irradiated human subjects, the prediction of effects at radiation levels so low that the effects cannot be measured directly by follow-up studies, and the question of net benefits.

40288 (INIS-mf—9646, pp 12-13) **Radiation effects in cells and tissues.** Szekely, J.G. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

40289 **(JINR—R-19-84-286) Gamma-irradiation and neutron effect on DNA-membrane complexes of mammalian cells.** Lapidus, I.L.; Nazarov, V.M.; Ehrtsgreber, G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701629.

Submitted to the Radiobiology.

The first results of radiobiological investigations in the biophysical channel of the JINR reactor IBR-2 are presented. Sedimentation behaviour of DNA-membrane complexes has been studied at irradiation of the Chinese hamster cells (VT9-4) in a wide dose range of ^{137}Cs γ-irradiation and neutrons. An earlier assumption of the authors on the role of DNA double-strand breaks in changing the relative sedimentation velocity of complexes at irradiation of cells with doses over 50 Gy has been confirmed.

40290 (KIYI—83-11, pp 6-20) **Free-radical oxidation in evaluation of the chemiluminescent characteristics of the irradiated animal blood plasma.** Serkiz, Ya.I.; Chebotarev, E.E.; Druzhina, N.A.; Pavlenko, I.O.; Khrienko, A.P. 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781275.

In Radiobiological studies on the U-240 isochronous cyclotron during 1982.

Using the method of kinetic chemiluminescent characteristics the state of free-radical oxidation processes in a body, irradiated by approximately 22 MeV fast neutrons has been studied. At that, irradiation of animals results in quantitative changes in the luminescence kinetics parameters. The investigation shows that the fast neutron exrosure leads to considerable changes in I_2 and ΣJ_5. Similar data are obtained following irradiation of animals by γ-quanta of Co^{60} and X-rays, as well as after radiation therapy of cancer patients. It testifies to the fact that in most of the cases (as some nontypical changes are manifested in certain animals) the second burst of luminescence is due to radiation-induced free-radical oxidation processes.

40291 (KIYI—83-11, pp 20-24) **d(50 MeV) → Be radiation field biological efficiency on test of the survived animals.** Indyk, V.M.; Bukanov, V.N.; Kataevskij, Yu.F.; Druzhina, N.A. 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781275.

In Radiobiological studies on the U-240 isochronous cyclotron during 1982.

Biological efficiency of ionizing radiation with different linear energy transfer (LET) has been investigated. Mice were irradiated by neutrons from the d(50 MeV) → Be reactions, p(50 MeV) → Be reactions, by fission neutrons and gamma-radiation (Co-60). It is shown that not only LET affects the index LD50/30, but also the magnitude of mean neutron energy. Irradiation of animals in the d(50 MeV) → Be radiation field with different dose rates (0.1-1.6 Gy/min) is not accompanied by considerable differences in its biological efficiency.

40292 (KIYI—83-11, pp 24-26) **Blood plasma inhibitor activity of animals irradiated by fast neutrons.** Druzhina, N.A.; Khrienko, A.P.; Serkiz, Ya.I. 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781275.

In Radiobiological studies on the U-240 isochronous cyclotron during 1982.

The inhibiting activity of the blood plasma of white mongrel rats totally irradiated by fast neutrons from the p(50 MeV) → Be reaction has been studied. The investigations are carried out in the dynamics of radiation syndrome development. The fast-neutron irradiation of animals is shown to result in early radiation effects manifested in wave-like changes in the blood plasma inhibiting activity with the minimum on the fourth day.

40293 (KIYI—83-11, pp 26-34) **Pheripheral blood indicators of animals, irradiated by fast neutrons of different energies.** Indyk, V.M.; Matvienko, A.S.; Arendt, N.M. 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781275.

In Radiobiological studies on the U-240 isochronous cyclotron during 1982.

Biological efficiency of fast neutrons from the d(50 MeV) → Be reaction and fission neutrons in lethal dose range with respect to the indices of cytological composition of the mice peripheral blood at early periods of radiation pathology has been investigated. It is shown that periods of erythpopenia manifestation do not depend on the dose of fission neutrons. Quantitative content of neutrophiles depends on the irradiation dose and average neutron energy. Rates of hemopoiesis restoration are more intense following irradiation with approximately 22 MeV fast neutrons.

40294 **(OAEP—1-102) Use of rapid quality control in determining mating propensity and mating competitiveness of irradiated Mediterranean fruit flies. Ceratitis capitata (Wiedeman) at various ages.** Poramarcom, R.; Kobayashi, R.M. (Office of Atomic Energy for Peace, Bangkok (Thailand)). Nov 1983. 11p. (In Thai). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701633.

Success of using irradiation to sterile males of various insect species for control or eradication by the sterile-insect release technique requires a certain dose for sterilizing without effects on mating behavior. This study was conducted at the Tropical Fruit and Vegetable Research Laboratory, Hawaii, to observe some radiation effects of this laboratory's currently used sterilizing dose on mating propensity and competitiveness of flies. The results of this study would be useful information for future research and use of this technique in Thailand. Mediterranean fruit flies, Ceratitis capitata (Wiedeman) were irradiated with 145 gray of gamma radiation from a cobalt-60 source in a nitrogen atmosphere 2 days before eclosion. Mating behavior of 3-6 day old flies were observed for 3 replications. The test of mating propensity was conducted by using two plexiglas cages containing 25 pairs of irradiated and non-irradiated flies in each cage. The results showed that there was no significant effect on mating propensity of treated 3-5 day old flies ($P = 0.05$), however, treated 6 day old flies, radiation effects were observed. The mating propensity increased with age of both non-irradiated and irradiated flies. Studies on the mating behavior of 20 pairs of non-irradiated and irradiated flies in a competitive situation showed that 3 and 5-6 day old non-irradiated flies of both sexes had higher mating competitiveness than irradiated flies ($P = 0.01$). The irradiated flies were more competitive than the 4 days old non-irradiated flies. Results of possible mating combination between irradiated and non-irradiated flies showed no significant difference in mating index ($P = 0.05$).

40295 **(OAEP—1-103) Effect of low-dose gamma irradiation on the shelf-life and quality of frozen shrimp (Penaeus merquiensis).** Nouchpramool, K.; Songprasertchai, S.; Pungsilpa, S. (Office of Atomic Energy for Peace, Bangkok (Thailand)). Dec 1983. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701636.

The effects of low-dose gamma irradiation on the shelf-life and quality of frozen shrimp (Penaeus merquiensis) has been studied. Fresh peeled shrimp and shell on headless shrimp were frozen and irradiated at doses of 2 and 4 kGy and held at -18 degC for seven months. Changes in total aerobic count, pH, trimethylamine nitrogen, total volatile basic nitrogen, rancidity and sensory of irradiated and non-irradiated frozen peeled and shell on headless shrimp were determined. Both frozen peeled and shell on headless shrimp, non-irradiated and irradiated at 2 and 4 kGy, were found to be within the acceptable range on a nine point hedonic scale even after seven months of frozen storage. However, storage period should not be more than four months, from a viewpoint of quality retention. Irradiation of frozen shrimp at doses of 2 and 4 kGy reduced microbial levels by 2-3 log cycles. The irradiated product was found to be free of faecal coliform and Escherichia coli. The chemical, physical, and bacteriological attributes used as objective indices did not serve as a useful index of quality. Their values were low and variable during storage to correlate them with sensory quality. It is proposed that dose of 2 kGy is adequate for a radurized frozen shrimp process.

40296 **(OAEP—1-106) Stimulation effects of gamma radiation on mung bean (Vigna radiata (L) Wilzcek).** Phadvibulya, V.; Vanichvattanaramlug, N.; Pichitporn, S. (Office of Atomic Energy for Peace, Bangkok (Thailand)). Dec 1983. 16p. (In Thai). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701632.

Mung bean seeds of U-Thong 1 variety were treated with gamma radiation at different doses 0, 5, 10, 15, 20, 25, 30, 50, 75, 100, 200 and 400 gray respectively. Their germination, growth and yield were observed in a greenhouse and in a field. Their chromosome behaviors were also studied in laboratory. The results were found that no significant effects of gamma radiation on germination, growth, yield and meiotic behavior of chromosomes at dose ranging from 5 to 400 gray.

40297 **(ORNL—6201) Biomedical and Environmental Sciences Program publications 1984.** Gerstner, H.B.; Branam, K.M.; Littleton, L.W.; Norman, V.S.; Thompson, E.H. (Oak Ridge National Lab., TN (USA)). Jul 1985. Contract AC05-84OR21400. 86p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85015070.

This bibliography contains 665 references to journal articles, books, book chapters, proceedings, reports, and abstracts. Certain types of publications are not included: theses, book reviews, internal documents, and periodic progress reports (with the exception of annual reports). Publications from divisions that report to the Associate Laboratory Director for Biomedical and Environmental Sciences (ADBES) are listed here, as well as publications from divisions that receive funding through the ADBES office. The references are sorted by type (journal articles, etc.), then by division, and, within each division, alphabetically by first author. Author and journal indexes are included in the back.

40298 **(PB—85-177020/XAB) Assigned share for radiation as a cause of cancer: review of radioepidemiologic tables assigning probabilities of causation. Final report.** (National Academy of Sciences - National Research Council, Washington, DC (USA)). Dec 1984. 223p. NTIS, PC A10/MF A01.

The Oversight Committee on Radioepidemiologic Tables was established by the National Research Council to review the work of the Ad Hoc Working Group to Develop Radioepidemiological Tables. The Working Group developed a series of tables showing estimated probabilities that a person who has a cancer developed it as a result of a previous dose of radiation. This report reviews the Working Group's sources of data, assumptions, epidemiologic and biostatistical methods, and means of handling uncertainty as laid out in its draft report dated July 1984. The Oversight Committee makes 25 specific recommendations for improvement of the tables and also discusses the implications of their use for compensation decisions and their potential influence on standards for radiation protection.

40299 **Neoplastic transformation is enhanced by multiple low doses of fission-spectrum neutrons.** Hill, C.K.; Carnes, B.A.; Han, A.; Elkind, M.M. (Argonne National Lab., IL). *Radiation Research;* **102**: No. 3, 404-410(Jun 1985). Contract W-31-109-ENG-38.

The neoplastic transformation of C3H mouse 10T1/2 cells was measured induced by fission-spectrum neutrons delivered at a high dose rate in five fractions over 4 days. The transformation frequency was significantly enhanced over that due to single equivalent total doses. These new data, in the low dose region, demonstrate an increased transformation frequency by fractionated versus single exposures of high-dose-rate fission-spectrum neutrons; an increase equal to that observed with low-dose-rate fission-spectrum neutrons. Estimates of the dose modifying factor (DMF), based upon the ratio of the initial linear portions of the induction curves for high-dose-rate neutrons and for low-dose-rate neutrons. However, when these results are compared to those following high-dose-rate ^{60}Co γ rays (100 rad/min), the relative biological effectiveness (RBE) for low-dose-rate fission-spectrum neutrons based upon slope ratios is 19.6; similarly, the RBE relative to five daily fractions of ^{60}Co γ rays is 78.8.

40300 **^{243,244}Cm studies in C57BL/Do mice.** Jones, C.W.; Mays, C.W.; Lloyd, R.D.; Packer, S.M.; Taylor, G.N.; Smith, J.M.; McFarland, S.S. (Univ. of Utah School of Medicine, Salt Lake City). *Radiation Research;* **102**: No. 3, 307-313(Jun 1985). Contract AC02-76EV00119.

Three groups of C57BL/Do mice were injected with different activities of ^{243,244}Cm so that the long-term biological effects could be evaluated. Effective skeletal retention equations were used to calculate the cumulative mean skeletal dose in rad at 140 days before death in each group of mice. The primary objective of this study was to determine the relative biological effectiveness (RBE) of ^{243,244}Cm compared to ^{226}Ra, using bone sarcoma induction at the end point. Combined data for male and female mice permitted the RBE value +/- SD for ^{243,244}Cm to be calculated as 4.4 +/- 1.8 compared to 1.0 for ^{226}Ra. A comparison of RBE values from a previous study in this mouse strain and the value for ^{243,244}Cm from this study suggest that the trivalent actinides ^{241}Am, /sup 243,244/Cm, and ^{249}Cf are about three times less effective for bone sarcoma induction than ^{239}Pu.

40301 **Radionuclide injury to the lung.** Dagle, G.E.; Sanders, C.L. (Pacific Northwest Lab., Richland, WA). *Environmental Health Perspectives;* **55**: 129-137(Apr 1984). Contract AC06-76RL01830.

Radionuclide injury to the lung has been studied in rats, hamsters, dogs, mice and baboons. Exposure of the lung to high dose levels of radionuclides produces a spectrum of progressively more severe functional and morphological changes, ranging from radiation pneumonitis and fibrosis to lung tumors. These changes are somewhat similar for different species. Their severity can be related to the absorbed radiation dose (measured in rads) produced by alpha, beta or gamma radiation emanating from various deposited radionuclides. The chemicophysical forms of radionuclides and spatial-temporal factors are also important variables. As with other forms of injury to the lung, repair attempts are highlighted by fibrosis and proliferation of pulmonary epithelium. Lung tumors are the principal late effect observed in experimental animals following pulmonary deposition of radionuclides at dose levels that do not result in early deaths from radiation pneumonitis or fibrosis. The predominant lung tumors described have been of epithelial origin and have been classified, in decreasing frequency of occurrence, as adenocarcinoma, bronchioloalveolar carcinoma, epidermoid carcinomas and combined epidermoid and adenocarcinoma. Mesothelioma and fibrosarcoma have been observed in rats, but less commonly in other species. Hemangiosarcomas were frequently observed in dogs exposed to beta-gamma emitters, and occasionally in rats exposed to alpha emitters. These morphologic changes in the lungs of experimental animals were reviewed and issues relevant to the prediction of human hazards discussed. 88 references.

5602 Thermal Effects

REFER ALSO TO CITATION(S) 40281

5603 Chemicals Metabolism And Toxicology

REFER ALSO TO CITATION(S) 38782, 38818, 39653, 39654, 39655, 39656, 39657, 40162, 40210, 40281, 40297

40302 **(BNL—36757) Lung cancer in uranium miners and the implications of the U/V ratio in uranium-bearing particles.** Paschoa, A.S.; Wrenn, M.E.; Singh, N.P.; Bruenger, F.W.; Miller, S.C.; Cholewa, M.; Jones, K.W. (Utah Univ., Salt Lake City (USA). Coll. of Medicine; Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 14p. (CONF-8505112—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014833.

From 2. international symposium on the biology and toxicology of metals using nuclear analytical methods; Upton, NY, USA (20 May 1985).

Several geological formations mined for uranium ore during and after the second World War had been mined earlier for vanadium. Most miners and millers from the Utah-Colorado mining region worked with this ore or its tailings at one time or another. Preliminary investigation to determine the size and location of uranium-bearing particles retained in the lungs of a former uranium miner and miller from this region, who died of lung cancer (mesothelioma), showed a high nonuniform distribution of vanadium. This observation leads to the hypothesis that the vanadium content in that lung could be associated with inhaled particles. Further examination of spectra of characteristic x-rays obtained by scanning micro-PIXE (particle induced x-ray emission) of an autopsy sample of this lung indicated that vanadium was indeed present in localized sites within the 20 μm spatial resolution of the proton beam. This work points out that the vanadium found in the lungs of this former miner and miller is nonuniformly distributed, and can be used for site localization and size determination of inhaled particles retained in the lungs. The meaning of U/V ratios in dust particles and in lungs is discussed. Further studies are in progress to: (1) locate uranium-bearing particles in lung tissues of former uranium miners and millers; and (2) evaluate the local alpha doses received from these particles. 11 refs., 3 figs., 1 tab.

40303 **(CONF-8505178—1) Measurement of unscheduled DNA synthesis in germ cells of the male mouse (Mus musculus).** Sega, G.A. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 36p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85014315.

From Collaborative study on short-term tests for genotoxicity and carcinogenicity; Cap d'Adge, France (14 May 1985).

An in vivo test was used to measure induced unscheduled DNA synthesis (UDS) in the germ cells of male mice exposed to the chemicals. Early spermatids, a DNA-repair competent stage, were used to test the effects of 2-acetylaminofluorene (2-AAF), 4-acetylaminofluorene, (4-AAF), benzopyrene (BP), pyrene (PYR), and methyl methanesulfonate. Neither the two "carcinogens", 2AAF and BP, nor the two "non-carcinogens", 4AAF and PYR, induced a measurable response in the early spermatids at any exposure used. 15 refs., 7 figs., 7 tabs.

40304 **(CONF-8506137—7) Information from specific-locus mutants on the nature of induced and spontaneous mutations in the mouse.** Russell, L.B. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014313.

From 4. international conference on environmental mutagens; Stockholm, Sweden (24 Jun 1985).

Genetic and molecular analyses of mutations are increasing the qualitative capabilities of the specific-locus test (SLT). Some mutations are found to be deletions of large numbers of genes, including some that control survival at various developmental stages, neurological functions, enzyme syntheses, etc. Smaller (including possibly single-gene) deletions are also detected. A third group of SLT mutations represents intragenic lesions. For at least three of the loci, mutations may now be qualitatively grouped on the basis of simple phenotypic findings. Type of mutagen and germ-cell stage exposed strongly influence the nature of the lesions. The qualitative information from SLT results makes possible conclusions about relative potential harmfulness of different types of exposures that may yield equal mutation rates, about differences between induced and spontaneous mutations, etc. It also identifies genetic material suitable for basic studies. 14 refs., 1 fig., 1 tab.

40305 **(CONF-8506137—8) Cell-specific activation of chemical carcinogens into mutagens for cultured human and rodent cells.** Huberman, E.; Oravec, C.T.; Jones, C.A. (Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014999.

From 4. international conference on environmental mutagens; Stockholm, Sweden (24 Jun 1985).

The objective of in vitro bioassays is to predict the carcinogenic risk to man of exposure to environmental chemicals. Because most chemical carcinogens are mutagenic after appropriate metabolic activation, it is believed that the process of malignant transformation is initiated by "mutational events" in genes that control cell growth and differentiation. Mutagenic activity as measured in in vitro assays is, therefore, widely used as an indicator of carcinogenic hazard from chemicals, These in vitro assays, although useful, have a number of deficiencies: (1) the mutagenic activity of many

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chemicals is not necessarily related to their carcinogenic effectiveness; (2) the organ to be affected by the carcinogen is usually not indicated; and (3) the response of the bacterial or rodent cells used in these assays to the tested chemicals may be different from that of human cells. This paper describes efforts overcome some of the shortcomings in these assays. In this context, we have developed mammalian cell-mediated mutagenesis assays that may circumvent some of these deficiencies. 28 refs.

40306 **(DOE/ER/60166—1) Field studies of sweet potatoes and cowpeas in response to elevated carbon dioxide. Progress report.** Biswas, P.K. (Tuskegee Inst., AL (USA)). 1985. Contract AS05-83ER60166. 129p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE85015208.

The physiological and biochemical effects of enriched CO_2 on sweet potatoes and cowpeas were studied in open top chambers. The main task was to assemble equipment to generate test atmospheres of CO_2 in the field, using open top chambers as the basic exposure unit for studying the response of sweet potatoes and cowpeas to enriched CO_2. Plant responses to CO_2 in open top chambers have been demonstrated by several investigators in a variety of crops. This study focused on growth and development of both sweet potatoes and cowpeas at levels of CO_2 ranging from the ambient level of 354 ppM to 659 ppM. The effects of CO_2 on leaf and stem weights, stem length, leaf area, and stomatal number and conductance were studied on both species. Additional studies on sweet potatoes included the effects of CO_2 on the weight, chemical content and quality of tubers. Additional studies on cowpeas included the effects of CO_2 on the weight of seeds and rate of nitrogen fixation. 27 figs., 35 tabs. (ACR)

40307 **(DOE/ER/60257—1) Effect of elevated atmospheric CO_2 on plant communities. Annual report, 1984-1985.** Bazzaz, F.A. (Harvard Univ., Cambridge, MA (USA). Biological Labs.). 1985. Contract FG02-84ER60257. 35p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015575.

The effects of elevated CO_2 on species relationships were examined by exposing competing groups of plants to high CO_2 and analyzing their ecological and physiological responses. We are analyzing total community productivity in these groups to learn about which combinations of species and resources show enhanced productivity with increased CO_2 and which do not.

40308 **(DOE/EV/03140—T4) Toxicology and metabolism of nickel compounds. Progress report, 1 December 1984-30 November 1985.** Sunderman, F.W. Jr. (Connecticut Univ., Farmington (USA). School of Medicine). 15 Jul 1985. Contract AC02-76EV03140. 26p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015111.

Administration of $NiCl_2$ to rats was shown to cause lipid peroxidation. Acute hepatic injury induced by $NiCl_2$ in rats was found to be associated with microvesicular steatosis of hepatocytes, substantial increases of serum aspartate aminotransferase and alanine aminotransferase activities, and diminished activity of serum alkaline phosphatase. Biliary excretion was observed to be quantitatively unimportant for the elimination of nickel. Less than 0.5% of injected ^{63}Ni was excreted in rat bile within 24 hr after administration of $^{63}NiCl_2$. During 24 hr after administration of $^{63}NiCl_2$ to rats, 2% of total renal ^{63}Ni was present in nuclei that were isolated by sucrose gradient centrifugation. Combined administration of diethyldithiocarbamate (DDC) and $^{63}NiCl_2$ doubled the uptake of ^{63}Ni into renal nuclei. Enhanced nuclear uptake of ^{63}Ni evidently explains the synergistic effects of DDC and $NiCl_2$ on induction of renal heme oxygenase activity. Tissue culture of cells from a Ni_3S_2-induced renal adenocarcinoma resulted in an aggressive tumor cell line that secretes erythropoietin into the medium and induces invasive, metastasizing tumors in nude mice. An accurate, sensitive, and convenient method was developed for tissue nickel analysis by Zeeman atomic absorption spectrophotometry (ZEAAS). The direct ZEAAS procedure was used to measure nickel concentrations in human subjects, including healthy controls, patients with acute myocardial infarction and severe angina pectoris, patients with maintenance hemodialysis for end-stage renal disease, patients with disulfiram therapy of chronic alcoholism, and patients with stainless-steel hip prostheses. 22 refs., 3 tabs.

40309 **(GSF-A—6-84) Heavy metals. Biological actions and effects and sources of exposure.** (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.)). Sep 1984. 160p. (In German). (CONF-8403200—). NTIS (US Sales Only), PC A08/MF A01. File Number DE85752362.

From Seminar of the Gesellschaft fuer Strahlen- und Umweltforschung mbH Muenchen; Munich, F.R. Germany (1 Mar 1984).

The volume on hand contains 17 papers dealing with analysis issues of heavy metals, their behaviour in animal bodies and their actions and effects including biochemical kinetics.

40310 **(GSF-A—7/84-Ed.2) Compilation of data sources for existing chemicals.** Voigt, K.; Rohleder, H. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.)). Nov 1984. 254p. NTIS (US Sales Only), PC A12/MF A01. File Number DE85752361.

This compilation of data sources is primarily intended as a tool for the so-called priority setting process, i.e. the selection of those substances among existing chemicals that most urgently need information and data development for environmental and/or human health hazard assessment. The hazard potential of different substances may vary considerably, and it seems reasonable to reduce the number of chemicals stepwise. As a consequence, some basic data are needed for many chemicals in the early stages of priority setting while more and more data become necessary in the later stages leading possibly to hazard assessment that will require a comprehensive set of information and data. With that concept in mind, preference has been given to handbooks and tables because they usually cover broad ranges and varieties of substances. Monographs, reports and other printed documents are included whenever they give valuable data compilations for important properties. Furthermore, some computerized databases are incorporated if they offer experimental data. However, the many bibliographic databases have been excluded although some of them could be used in the case that they contain abstracts with experimental data like e.g. MEDLINE, TOXLINE, CANCERLINE, BIOSIS and others. Journals which publish occasionally minor data compilations have also not been included as well as lists of chemicals which have been created on qualitative criteria without data. 230 handbooks and tables, 401 monographs, reports and other printed documents, 58 computerized databases, all together 689 data sources are documented. When using these sources, it should be kept in mind that the quality of the data varies among the documents.

40311 **(INIS-mf—9646, pp 34-35) Use of radioautography to study lead localization in plants.** Tung, G.; Palmer, K.T. (Ontario Ministry of the Environment, Toronto (Canada)). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

40312 **(Juel—1974) Concentrations of 15 trace elements in some selected adult human tissues and body fluids of clinical interest from several countries: Results from a pilot study for the establishment of reference values.** Iyengar, G.V. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Medizin). Feb 1985. 161p. NTIS (US Sales Only), PC A08/MF A01. File Number DE85752360.

Over 60 investigators, many of them with an outstanding international reputation as analysts were requested for reliable data from their countries on elemental concentrations in normal adult human samples of clinical interest. A set of samples consisting of whole blood, blood serum, erythrocytes, urine, milk, liver and hair were chosen and considered for 15 elements of biological significance: As, Cd, Cr, Co, Cu, F, I, Fe, Pb, Mn, Hg, Mo, Ni, Se and Zn. The results represent wholly or partially data received from 40 countries of the global regions of Africa, Asia, Europe, North, South and Central Americas, Australia and New Zeeland. This survey even if qualitative, has been useful in demonstrating certain trends of the trace element scenario around the world. It is of course recognized that both diet and environment exert a strong in-

fluence on the distribution pattern of several elements such as As, Cd, Mn, Pb, Se and Zn. A limited comparison of the available information on soil status of different countries revealed interesting associations for elements such as Mn and Zn.

40313 **(Juel—Spez-296) Search for indicatory criteria to predict possible effects of stress on ecosystems. Vol. 6.** Scheele, B.; Fuehr, F.; Stuettgen, E. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Projekttraeger Oekologische Forschung). Jan 1985. 161p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE85752358.

Reports on 10 individual studies are presented describing research within the framework of the project 'Search for indicatory criteria to predict possible effects of stress on ecosystems'. These studies have been initiated with financial support of the Ministry of Research and Technology. They deal with the development of criteria that are indicatory for structure and function at the organizational level of ecosystems. Several terrestrial ecosystems as forest, grassland, ruderal and agricultural ecosystems are studied in field experiments. For analysis and evaluation several floristic and faunistic parameters as well as some aspects of productivity were determined. Furthermore, these criteria were checked for their sensitivity to chemical stress induced by Pentachlorphenol (PCP). In some cases modelecosystems were used to explain or to confirm the chemical action.

40314 **Cadmium inhalation exposure estimates: their significance with respect to kidney and liver cadmium burden.** Ellis, K.J.; Cohn, S.H.; Smith, T.J. (Brookhaven National Lab., Upton, NY). *Journal of Toxicology and Environmental Health;* **15**: No. 1, 173-187(1985).

Cadmium exposure histories based on employment records, area monitoring techniques, and personal sampling data were obtained for 82 industrially exposed workers. From these data, a time-weighted cumulative exposure index (TWE) was calculated for each worker by multiplying the length of time (ti) in a given work area by the estimated exposure conditions for that area and year (Ei) and then summing these values for the total exposure history TWE = sigma iEiti The cadmium body burden for each worker was measured directly by the in vivo prompt-gamma neutron activation technique. The cadmium content of the left kidney and the liver were measured. For the actively employed workers, a significant correlation was observed between the exposure index (TWE) and the liver cadmium burden. Furthermore, whenever the worker's liver burden exceeded 40 ppm and the exposure index exceeded 400-500 micrograms/m3 X yr, there was evidence of renal abnormalities (usually elevated urinary beta 2-microglobulin). The highest correlation was obtained between the kidney cadmium burden data and the exposure index for the active workers without evidence of kidney dysfunction. The percentage of workers with renal abnormalities was found to increase as the exposure index increased. When this relationship was examined using linear logistic regression analysis, the following model was indicated: logit p = 1.24 ln TWE--8.34 where p is the individual worker's probability of being classified as having renal dysfunction.

40315 **Role of toxicological interactions in lung injury.** Witschi, H.P.; Hakkinen, P.J. (Oak Ridge National Lab., TN). *Environmental Health Perspectives;* **55**: 139-148(Apr 1984). Contract W-7405-ENG-26.

Interactions between two or more toxic agents can produce lung damage by chemical-chemical interactions, chemical-receptor interactions or by modification, by a first agent, of the cell and tissue response to a second agent. Interactions may occur by simultaneous exposure and if exposure to two agents is separated in time. Chemical-chemical interactions have been mostly studied in the toxicology of air pollutants, where it was shown that the untoward effect of certain oxidants may be enhanced in the presence of other aerosols. Interactions at the receptor site have been found in isolated perfused lung experiments. Oxygen tolerance may be an example, when pre-exposure to one concentration of oxygen mitigates later exposure to 100% oxygen by modifying cellular and enzymatic composition of the lung. Damage of the alveolar zone by the antioxidant butylated hydroxytoluene (BHT) can be greatly enhanced by subsequent exposure to oxygen concentration which, otherwise, would have little if any demonstrable effect. The synergistic interaction between BHT and oxygen results in a resulting interstitial pulmonary fibrosis. Acute or chronic lung disease may then be caused not only by one agent, but very likely in many instances by the interaction of several agents. 121 references.

5604 Other Environmental Pollutant Effects

REFER ALSO TO CITATION(S) 38771, 38773, 38774, 38775, 38776, 38777, 38778, 38779, 38780, 38781, 40201, 40891

40316 **(AD-A—152731/6/XAB) Biological and human health effects of extremely low-frequency electromagnetic fields. Post-1977 literature review. Final report 1977-1984.** (American Inst. of Biological Sciences, Arlington, VA). Mar 1985. 361p. NTIS, PC A16/MF A01.

Report of the Committee on Biological and Human Health Effects of Extremely Low Frequency Electromagnetic Fields.

An evaluation of the applicable literature conducted by scientific and engineering experts assembled by the A I B S was completed for the 1977-1984 period. The expert committee concluded from their evaluation that electromagnetic field exposure associated with the U.S. Navy's Extremely Low Frequency (ELF) Communication System is unlikely to produce adverse public health effects or adverse effects on plants and animals. Information included in this report pertains to Coupling of Living Organisms to ELF Electric and Magnetic Fields; Possible Biophysical Mechanisms of Electromagnetic Interactions with Biological Systems; Biological Effects of ELF Magnetic Fields; Cellular Studies of Effects of ELF Electric and Magnetic Fields; Interaction of ELF Electric and Magnetic Fields with Neural and Neuroendocrine Systems; Hematologic and Immunologic Effects of Extremely Low Frequency Electromagnetic Fields; Reproductive and Developmental Effects in Mammalian and Avian Species from Exposure to ELF Fields; Human Studies of Carcinogenic, Reproductive, and General Health Effects of ELF Fields; Potential Effects on Natural Biota of Operating an Extremely Low Frequency Communications System; and Extremely Low Frequency (ELF) Communications System and Its Electromagnetic Fields.

40317 **(BM-IC—8986) Noise control. Proceedings: Bureau of Mines technology transfer seminars.** (Bureau of Mines, Washington, DC (USA)). 1984. 139p. (CONF-8407131—; CONF-8407132—). US Bureau of Mines, 2401 E. Street, NW, Washington, DC 20241. File Number TI85901533.

From Bureau of Mines technology transfer seminars; Pittsburgh, PA, USA (24 Jul 1984).

Overexposure to noise is a widespread, serious health hazard in the mining industry, and causes hearing losses to a large percentage of the mining population. Recognizing this fact, the Bureau has a major ongoing research effort to address this problem area. These proceedings include an overview of the Bureau noise control program and summarize nine selected noise control research programs.

40318 **(LBL—18384) Monitoring of circadian waveforms in rodents exposed to high-intensity static magnetic fields.** Tenforde, T.S.; Levy, L.; Veklerov, E. (Lawrence Berkeley Lab., CA (USA)). Oct 1984. Contract AC03-76SF00098. 38p. (CONF-841041—2). NTIS, PC A03/MF A01; GPO Dep. File Number DE85015225.

From 23. Hanford Life Sciences symposium--interaction of biological systems with static and ELF electric and magnetic fields; Richland, WA, USA (2 Oct 1984).

A system has been developed for the noninvasive monitoring of circadian variables in mice exposed to a 1.50 T (1 Tesla = 10^4 Gauss) static magnetic field. The ambient light level, temperature and relative humidity within the exposure chamber are closely regulated, and physiological monitoring systems provide simultaneous measurements of seven circadian variables: (1) climbing activity on a triangular bar, (2) migratory activity, (3) body mass, (4) respired carbon dioxide, (5) nutrient consumption, (6) urine excretion, and (7) fecal excretion. Data from the various transducers and environmental monitoring devices within the exposure system are recorded on magnetic tape at 5-min intervals throughout experiments of 50 to 60 days duration, and the circadian waveforms of behavioral and

physiological parameters are analyzed by a modification of the cosiner method using a high-speed computer. Exposure of adult female LAF-1 mice to a 1.50-T homogeneous field for 5 continuous days, or for 10 consecutive days with intermittent daily exposures on an 8-hr-on/16-hr-off cycle, has been found to produce no significant alterations in the circadian waveforms of behavioral or physiological parameters. 13 refs., 11 figs., 2 tabs.

40319 **(LBL—19711) Magnetic field applications in modern technology and medicine.** Tenforde, T.S. (Lawrence Berkeley Lab., CA (USA)). May 1985. Contract AC03-76SF00098. 37p. (CONF-8505183—1). NTIS, PC A03/MF A01; GPO Dep. File Number DE85015197.

From Symposium on biological effects of static and extremely-low-frequency magnetic fields; Neuherberg, F.R. Germany (13 May 1985).

A brief summary is given of several major applications of magnetism. A description of the range of magnetic field intensities to which humans are exposed in technologies that utilize large stationary magnetic fields is given. 12 refs., 8 figs., 3 tabs.

40320 **(PB—85-177152/XAB) Compendium of materials for noise control. Technical report.** Hedeen, R.A. (IIT Research Inst., Chicago, IL (USA)). May 1980. 399p. NTIS, PC A17/MF A01.

The compendium of commercial noise-reduction materials and systems was developed for use by plant engineers, industrial hygienists, acoustical consultants, and others engaged in noise-control. It can be used to determine the availability of noise control products, their characteristics and specifications, and their supply sources. Also included is a technical discussion of operating principles, uses, and limitations of the products listed.

40321 **(PB—85-177525/XAB) Health-hazard evaluation report HETA 81-415-1385, High Voltage Maintenance Corporation, Mentor, Ohio.** Kominsky, J.R.; Lipscomb, J. (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)). Oct 1983. 24p. NTIS, PC A02/MF A01.

In September 1981 the National Institute for Occupational Safety and Health (NIOSH) was requested to evaluate exposures to polychlorinated biphenyls (PCBs) and to chlorinated benzenes and ethanes for electricians at High Voltage Maintenance (HVM) Corp., Mentor, Ohio. The HVM Corp. services electrical power transformers and capacitors on a contract basis with the work performed both in the field and at the Mentor facilities. On the basis of the data collected, NIOSH concludes that workers were exposed to potentially toxic concentrations of airborne 1,1,1-trichloroethane and PCBs. Significant PCB contamination of work surfaces demonstrate a potential for continued exposure to PCBs via skin contact and ingestion. PCB blood levels also indicate excessive absorption of PCBs. Recommendations for decontamination of the buildings and exposure controls are offered in Section VIII of this report.

40322 **(PB—85-177558/XAB) Health-hazard evaluation report HETA 82-359-1382, Indiana and Michigan Power Company, Rockport Construction Project, Rockport, Indiana.** Stephenson, R.L.; Egilman, D.S. (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)). Oct 1983. 18p. NTIS, PC A02/MF A01.

In August 1982, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate employee exposures during spray painting operations of the coal storage silo and transformer firewall at the Indiana and Michigan (I and M) Power Company's Rockport Construction Project in Rockport, Indiana. The request was prompted due to the spray painters reported exposures to isocyanate paint and reported symptoms of eye irritation and shortness of breath. On the basis of the data obtained during this investigation, NIOSH has determined that the symptoms reported in the request were related to previous isocyanate painting operations when supplied-air respirators were not used and that this constituted a health hazard. Medical assessments of the spray painters did not reveal any isocyanate related symptoms when supplied-air respirators were used. Exposure to MDI under the supplied-air hood is currently within the NIOSH recommended standards, but MDI might cause adverse effects even at these levels. Recommendations to reduce potential exposures are included in Section VIII of this report.

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40323 **(EPRI-CS—4094) Design manual for reducing airborne PCB contamination. Final report.** West, B.W.; Hansen, W.G. (West and Hansen Engineers, Inc., Seal Beach, CA (USA)). Jul 1985. 138p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920761.

This manual presents techniques and procedures for use by electric utilities undertaking airborne PCB contamination prevention programs. Objective is to provide utilities with guidelines for implementing efficient and cost effective airborne spill risk reduction. Askarel cooled transformers located indoors or directly adjacent to buildings are considered. Various alternatives for providing effective risk reduction are defined. Guidelines for planning, staffing, budgeting and performing a comprehensive risk reduction program are given. Methods, worksheets, personnel requirements and scheduling guidelines for conducting risk reduction field surveys are described. Procedures for quantifying the relative airborne spill risk from askarel transformers are developed. Methods and data forms for organizing preventative engineering design information are presented. Guidelines for preparing plans and specifications are included.

40324 **(LA—10365-PR) Occupational health and environment research 1983: Health, Safety, and Environment Division. Progress report.** Voelz, G.L. (comp.). (Los Alamos National Lab., NM (USA)). May 1985. Contract W-7405-ENG-36. 89p. NTIS, PC A05/MF A01; GPO Dep. File Number DE85016207.

The primary responsibility of the Health, Safety, and Environment (HSE) Division at the Los Alamos National Laboratory is to provide comprehensive occupational health and safety programs, waste processing, and environmental protection. These activities are designed to protect the workers, the public, and the environment. Evaluation of respiratory protective equipment included the XM-30 and M17A1 military masks, use of MAG-1 spectacles in respirators, and eight self-contained units. The latter units were used in an evaluation of test procedures used for Bureau of Mines approval of breathing apparatuses. Analyses of air samples from field studies of a modified in situ oil shale retorting facility were performed for total cyclohexane extractables and selected polynuclear aromatic hydrocarbons. Aerosols generation and characterization of effluents from oil shale processing were continued as part of an inhalation toxicology study. Additional data on plutonium excretion in urine are presented and point up problems in using the Langham equation to predict plutonium deposition in the body from long-term excretion data. Environmental surveillance at Los Alamos during 1983 showed the highest estimated radiation dose from Laboratory operations to be about 26% of the natural background radiation dose. Several studies on radionuclides and their transport in the Los Alamos environment are described. The chemical quality of surface and ground water near the geothermal hot dry rock facility is described. Short- and long-term consequences to man from releases of radionuclides into the environment can be simulated by the BIOTRAN computer model, which is discussed brirfly.

58 GEOSCIENCES

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 38822, 38904, 38905, 38906, 38907, 38909, 38914, 38930, 39669, 39671, 40188, 40190

40325 (GSCan-P—83-1A, pp 469-472) **Radiocarbon dating of interlaboratory check samples.** Blake, W. 1983. NTIS (US Sales Only), PC A22/MF A01. File Number DE85781277.

In Current research: Part A.

This note presents the results of a series of interlaboratory age determinations in which the Geological Survey of Canada's Radiocarbon Dating Laboratory has been involved. There is good agreement between laboratories, although there may be other problems related to the interpretation of individual samples.

40326 (GSCan-P—83-1A, pp 391-397) **Preliminary studies on gamma ray spectral logging for gold.** Mwenifumbo, C.J.; Killeen, P.J. (Geological Survey of Canada, Ottawa, Ontario); Urbancic, T.I. (Toronto Univ., Ontario (Canada). Dept. of Geology). 1983. NTIS (US Sales Only), PC A22/MF A01. File Number DE85781277.

In Current research: Part A.

Several studies have indicated that the distribution of the naturally occurring radio-elements (K, U, Th) can serve as a useful guide to gold deposits. This is because most gold deposits are characterized by wall rock alterations (adularization and sericitization) in which potassium, including the radioactive isotope K-40 is considerably enriched. Theoretically it should be possible to outline areas enriched in potassium by gamma ray spectrometry. Preliminary invesigations have been conducted to observe and confirm this gold-potassium correlation and evaluate its usefulness in gold exploration. The distribution of the naturally occurring radioactive elements (K, U, Th) has been determined by gamma ray spectral logging in several boreholes intersecting gold mineralization in the Larder Lake area of Ontario.

40327 (GSCan-P—83-1A, pp 329-342) **Geology and U-Pb geochronology of parts of the Leith Peninsula and Riviere Grandin map areas, District of Mackenzie.** Hildebrand, R.S. (Geological Survey of Canada, Ottawa, Ontario); Bowring, S.A.; Van Schmus, W.R. (Kansas Univ., Lawrence (USA). Dept. of Geology); Steer, M.E. (Memorial Univ. of Newfoundland, St. John's (Canada). Dept. of Earth Sciences). 1983. NTIS (US Sales Only), PC A22/MF A01. File Number DE85781277.

In Current research: Part A.

This report describes the geology of parts of the Hottah Terrane and Great Bear Magmatic Zone, Wopmay Orogen, which were mapped during the 1982 field season. On Leith Ridge the Hottah Terrane comprises schists, orthogneiss, and foliated granitoid plutons. One of the deformed plutons is 1902 +- 4 Ma. These rocks are cut by plutons of the Great Bear batholith. At Hottah Lake, rocks of the Hottah Terrane include metasedimentary and metavolcanic rocks plus a variety of deformed plutons, one of which is 1914 +- 2 Ma. Unconformably overlying the Hottah Terrane in the Hottah Lake area is a varied and complex sequence of sedimentary rocks, subaerial siliceous to mafic lava flows, ash-flow tuff, and pillow basalts - all intruded by mafic sills. The Hottah Terrane and its cover sequence were later intruded by granitoid plutons of the Great Bear batholith. Regional geological and geochronological considerations suggest that the Hottah Terrane is allochthonous with respect to the Coronation margin and was accreted about 1900-1890 Ma.

40328 **(GSCan-P—83-1A) Current research: Part A.** (Geological Survey of Canada, Ottawa, Ontario). 1983. 508p. NTIS (US Sales Only), PC A22/MF A01. File Number DE85781277.

Items within the scope of EDB have been entered individually into the data base. (ACR)

40329 (GSCan-P—83-1B, pp 127-134) **Summary of Rb-Sr isotope studies in the Archean Hopedale Block and the adjacent proterozoic Makkovik subprovince, Labrador. Report 5.** Grant, N.K.; Hickman, M.H. (Miami Univ., Oxford, OH (USA)); Marzano, M.S. (Dept. of Geology, Marietta College, Marietta, OH (USA)); Ermanovics, I.F. (Geological Survey of Canada, Ottawa, Ontario). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781278.

In Current research: Part B.

Rb-Sr isotope study of thirteen whole-rock suites of Archean and Proterozoic rocks from Hopedale block and Makkovik Subprovince shows that the crustal history began about 3115 Ma ago. We tentatively recognize younger crustal segments that formed 2920 Ma ago, from which Kanairktok intrusives were derived at 2832 +- 178 Ma. In Makkovik Subprovince the Island Harbour granites range in age from 1843 +- 90 to 1794 +- 71 Ma. These ages overlap with the 1847 +-87 Ma age for Kanairktok shear zone mylonites. The Island Harbour granodiorites from inland localities to the southwest are contaminated with Archean rocks in Makkovik Subprovince and their initial $^{87}Sr/^{86}$ ratios imply a crustal contribution to their source. In contrast, the Island Harbour granites of Striped Island were derived from a mantle source. The sills of Striped Island are 1635 +- 47 Ma old. An undeformed northeast trending Kikkertavak dolerite dyke from Hopedale block is 1206 +- 120 Ma.

40330 (GSCan-P—83-1B, pp 419-421) **Fourfold significance of an early Silurian U-Pb zircon age from rhyolite in redbeds, southwest Newfoundland.** Chandler, F.W. (Geological Survey of Canada, Ottawa, Ontario); Dunning, G.R. (Memorial Univ. of Newfoundland, St. John's (Canada). Dept. of Earth Sciences). 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781278.

In Current research: Part B.

$^{207}Pb/^{206}Pb$ dating of zircons from a rhyolite flow in redbeds in southwest Newfoundland yielded a preliminary age of 431 +-5 Ma. The age, besides dating the redbeds, establishes that they are about 55 Ma older than a closely associated grey sedimentary sequence and should not be correlated with the Billiards Brook Formation and the Windsor Point Group that lie to the southwest. Because it has close lithological similarity with the redbeds, the Springdale Group to the northeast may also be of early Silurian age. The Annieopsquotch ophiolite, unconformably overlain by the redbeds, was emplaced before the extrusion of the dated rhyolite.

40331 **(GSCan-P—83-1B) Current research: Part B.** (Geological Survey of Canada, Ottawa, Ontario). 1983. 467p. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781278.

Items within the scope of EDB have been entered individually into the data base. (ACR)

40332 **(IAEA-R—2845-F) Isotopic study of Karst water. Final report for the period 1 April 1981-31 May 1984.** Leskovsek-Sefman, H. (International Atomic Energy Agency, Vienna (Austria)). Jan 1985. 47p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701623.

Measurement of the isotopic composition of water formed part of an extended investigation of the water drainage system in the Slovenian Karst. These studies were planned to complement geological and speleological investigations which are already being performed in this area, with the knowledge of the mechanism of changes in the isotopic composition of water in the natural environment on some smaller locations, Planina cave near Postojna where the vertical percolation of meteoric water through the karstified carbonate ceiling was studied and the water catchment areas of some small rivers, Ljubljanica, Rizana and Idrijca. Mass spectrometric investigations of the isotopic composition of some elements (^{18}O, D, ^{13}C and T) in water and in dissolved carbonates, as well as the isotopic composition of ^{18}O and ^{13}C in cave carbonates were performed. The results allow to conclude that the waters in karst aquifers in spite of producing the homogenisation to a great extent, qualitative determination of the retention time and of the prevailing sources for some springs and surface and underground water flows is nevertheless possible. The isotopic composition of ^{18}O in water and of ^{18}O and ^{13}C in dissolved carbonates depends on climatic conditions and on denudation processes. The investigation of cave carbonates revealed that they have different isotopic compositions of ^{18}O and ^{13}C because of different locations and also different ages.

40333 **(INIS-BR—258) Origin and control of the Camamu barite deposit (BA).** Campos, E.G. (Brasilia Univ. (Brazil). Dept. de Geociencias). 1984. 140p. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781448.

Geological and geochemical mechanisms responsible for the origin of the Camamu barite deposit (Bahia State) was studied. The marine origin of sulfate is confirmed by the isotopic studies of oxygen delta and sulphur delta.

40334 (INIS-mf—9655, pp 7) **Pleistocene climate and archaeology in Kashmir. New multidisciplinary data.** Agrawal, D.P. (Physical Research Lab., Ahmedabad (India)). 1983. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441. (CONF-830288—Absts.).

From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).
Abstract only.

40335 (INIS-mf—9655, pp 23) **Dendrochronology of bristlecone pine. A progress report.** Ferguson, C.W.; Graybill, D.A. (Arizona Univ., Tucson (USA). Lab. of Tree-Ring Research). 1983. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441. (CONF-830288—Absts.).
From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).
Abstract only; Poster presentation.

40336 (INIS-mf—9655, pp 27) **Radiocarbon dating of fossil bone apatite.** Head, M.J.; Polach, H.A. (Australian National Univ., Canberra. Radiocarbon Lab.). 1983. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441. (CONF-830288—Absts.).
From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).
Abstract only.

40337 (INIS-mf—9655, pp 33) **Calibrating the radiocarbon record. Old and new facts.** Jansen, H.S. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). 1983. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441. (CONF-830288—Absts.).
From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).
Abstract only.

40338 (INIS-mf—9655, pp 46) **Archaeometry. Past achievements and future prospects.** Tite, M.S. (British Museum, London. Research Lab.). 1983. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441. (CONF-830288—Absts.).
From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).
Abstract only.

40339 (INIS-mf—9655, pp 50) **Uranium-series and ESR dating at INS.** Whitehead, N.E. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). 1983. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441. (CONF-830288—Absts.).
From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).
Abstract only.

40340 **(INIS-mf—9655) Symposium on Archaeological Science in the Pacific Region. Pacific Science Congress, February 1-11 1983, jointly held with the Annual Conference of the Society for Archaeological Sciences.** (Otago Univ., Dunedin (New Zealand). Dept. of Anthropology). 1983. 57p. (CONF-830288—Absts.). NTIS (US Sales Only), PC A04/MF A01. File Number DE85781441.
From Symposium on archaeological science in the Pacific region; Dunedin, New Zealand (2 Feb 1983).
Abstract only.
Items within the scope of EDB have been entered individually into the data base. (ACR)

40341 **(ITEF—26(1983)) Energy losses of nonexciting electrons in dielectric materials.** Garin, B.M.; Byakov, V.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1983. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701806.
Irreversible evolution of the basic geotectonic elements of the lithosphere is considered, and, therefore, regular change in processes of endogenic, including uranium, mineralization is analyzed. Peculiarities of geological composition and ore content of different-age uranium-bearing regions are disclosed. Typomorphic for certain geological situations are series and cycles of endogenic deposits in which uranium mineralization occupies regular position are revealed. The paper is intended for geologists dealing with prospecting, exploration and studying deposits of uranium and other metals. 28 references.

40342 **(LA—10428-MS) Nevada Test Site field trip guidebook 1984.** Dockery, H.A.; Byers, F.M. Jr.; Orkild, P.P. (comps.). (Los Alamos National Lab., NM (USA)). Apr 1985. Contract W-7405-ENG-36. 51p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85015362.
The Nevada Test Site (NTS), located in southern Nevada, was established in 1950 as an area for testing nuclear devices. Various geologic studies performed in conjunction with these activities as well as recent work on a proposed radioactive waste repository are reported in detail in this guidebook and include studies on the structure, stratigraphy, geochemistry, and physical properties of the rocks at NTS. The oldest sequence of rocks exposed in the NTS region is comprised of late Precambrian to Permian miogeoclinal rocks which were subsequently deformed during Jura-Cretaceous contraction, probably related to the Sevier orogeny. These rocks were then locally intruded by late Mesozoic (~93 m.y.BP) plutonic rocks related to the Sierra Nevada batholith. Voluminous calcalkaline ash-flow tuffs and associated volcanic rocks originating from the Timber Mountain-Oasis Valley caldera complex were extruded over much of NTS and adjacent areas from ~16 to 10 m.y.BP. Peralkaline rocks intercalated in the volcanic sequence issued from both Silent Canyon (15 to 13 m.y.BP) and Black Mountain (9 to 7 m.y.BP) volcanic centers. The youngest igneous rocks at NTS are composed of basaltic rocks, primarily hawaiite, the older of which are associated with the evolving silicic volcanic centers and the younger associated with Cenozoic regional extension. Late Tertiary to Recent alluvium derived from the ranges form large, coalescing fans which fill the basins with sediments and reach thicknesses of over 1 km. 45 refs., 21 figs.

40343 **(LA—10455-MS) Subsurface geology of the Pajarito Plateau, Espanola Basin, New Mexico.** Dransfield, B.J.; Gardner, J.N. (Los Alamos National Lab., NM (USA)). May 1985. Contract W-7405-ENG-36. 23p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85016215.
Integration of data from wells, geophysical surveys, and surface exposures has enabled construction of structure contour and paleogeologic maps of the pre-Bandelier Tuff surface beneath the Pajarito Plateau. Numerous faults of the Rio Grande rift system cut the pre-Bandelier Tuff surface, and most have down-to-the-west displacements. Cumulative down-to-the-west movements across these faults from the Rio Grande on the east to the Rendija Canyon fault zone on the west exceed 600 ft (185 m). All faults in the area show evidence of recurrent activity, with increasing displacements of progressively older rock units. The southern Pajarito fault zone has over 600 ft (185 m) of pre-Bandelier Tuff down-to-the-east movement. The Pajarito fault zone and a major pre-Bandelier Tuff fault identified herein may constitute the local boundaries of the southern continuation of the intra-rift Velarde graben. The paleogeologic map shows that three major rock units (Cerros del Rio basalts, Tschicoma Formation dacites, and Puye Formation gravels) underlie the Bandelier Tuff and interfinger beneath the central Pajarito Plateau. 29 refs., 2 figs., 1 tab.

40344 (LBL—16920, pp 44-47) **Study of contaminant plume control in fractured porous media.** Tsang, C.F.; Mangold, D.C.; Doughty, C.; Javandel, I. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.
In Earth Sciences Division annual report 1983.

40345 (LBL—16920, pp 54-57) **Well-test data analysis from naturally fractured reservoirs.** Lai, C.H.; Bodvarsson, G.S.; Tsang, C.F.; Witherspoon, P.A. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.
In Earth Sciences Division annual report 1983.

40346 (LBL—16920, pp 57-59) **New mechanical transport model for networks of fractures.** Endo, H.K. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983

40347 (LBL—16920, pp 60-63) **Three-dimensional model for fluid flow in nonextensive fractures.** Long, J.C.S.; MacLean, H.M.; Witherspoon, P.A. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40348 (PNL-SA—13268) **Sedimentation rates in Puget Sound from ^{210}Pb measurements.** Lavelle, J.W.; Massoth, G.J.; Crecelius, E.A. (Pacific Marine Environmental Lab., Seattle, WA (USA)). Jan 1985. Contract AC06-76RL01830. 47p. (NOAA/TM-ERL-PMEL—61). NTIS, PC A03/MF A01; GPO Dep. File Number DE85015080.

Sixteen ^{210}Pb profiles from sites along the axis of the Main Basin of Puget Sound show that bottom sediments are accumulating at rates of 0.26 to 1.20 g/cm^2/yr; these along with seven rates earlier published suggest highest accumulation nearly midway along the length of this tidal current-dominated basin. Bioturbated surface layers of cores have also been found to be as deep as 40 cm, but biologic mixing rates are poorly determined. Individual ^{210}Pb accumulation rates have a range of from approximately one to five times areal average accumulation rates based on estimates of recent sediment input from riverine and shoreline sources. 34 refs., 3 figs.

40349 (RHO-BW-CR—145P) **Probability encoding of hydrologic parameters for basalt. Elicitation of expert opinions from a panel of five consulting hydrologists.** Runchal, A.K.; Merkhofer, M.W.; Olmsted, E.; Davis, J.D. (Analytic and Computational Research, Inc., Los Angeles, CA (USA); Applied Decision Analysis, Inc., Menlo Park, CA (USA); Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Nov 1984. Contract AC06-77RL01030. 164p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE85014846.

The Columbia River basalts underlying the Hanford Site in Washington State are being considered as a possible location for a geologic repository for high-level nuclear waste. To investigate the feasibility of a repository at this site, the hydrologic parameters of the site must be evaluated. Among hydrologic parameters of particular interest are the effective porosity of the Cohassett basalt flow top and flow interior and the vertical-to-horizontal hydraulic conductivity, or anisotropy ratio, of the Cohassett basalt flow interior. The Cohassett basalt flow is the prime candidate horizon for repository studies. Site-specific data for these hydrologic parameters are currently inadequate for the purpose of preliminary assessment of candidate repository performance. To obtain credible, auditable, and independently derived estimates of the specified hydrologic parameters, a panel of five nationally recognized hydrologists was assembled. Their expert judgments were quantified during two rounds of Delphi process by means of a probability encoding method developed to estimate the probability distributions of the selected hydrologic variables. The results indicate significant differences of expert opinion for cumulative probabilities of less than 10% and greater than 90%, but relatively close agreement in the middle ranges of values. The principal causes of the diversity of opinion are believed to be the lack of site-specific data and the absence of a single, widely accepted, conceptual or theoretical basis for analyzing these variables.

40350 (RHO-BW-CR—146P) **Probability encoding of hydrologic parameters for basalt. Elicitation of expert opinions from a panel of three basalt waste isolation project staff hydrologists.** Runchal, A.K.; Merkhofer, M.W.; Olmsted, E.; Davis, J.D. (Analytic and Computational Research, Inc., Los Angeles, CA (USA); Applied Decision Analysis, Inc., Menlo Park, CA (USA); Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Nov 1984. Contract AC06-77RL01030. 73p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85014665.

The present study implemented a probability encoding method to estimate the probability distributions of selected hydrologic variables for the Cohassett basalt flow top and flow interior, and the anisotropy ratio of the interior of the Cohassett basalt flow beneath the Hanford Site. Site-speciic data for these hydrologic parameters are currently inadequate for the purpose of preliminary assessment of candidate repository performance. However, this information is required to complete preliminary performance assessment studies. Rockwell chose a probability encoding method developed by SRI International to generate credible and auditable estimates of the probability distributions of effective porosity and hydraulic conductivity anisotropy. The results indicate significant differences of opinion among the experts. This was especially true of the values of the effective porosity of the Cohassett basalt flow interior for which estimates differ by more than five orders of magnitude. The experts are in greater agreement about the values of effective porosity of the Cohassett basalt flow top; their estimates for this variable are generally within one to two orders of magnitiude of each other. For anisotropy ratio, the expert estimates are generally within two or three orders of magnitude of each other. Based on this study, the Rockwell hydrologists estimate the effective porosity of the Cohassett basalt flow top to be generally higher than do the independent experts. For the effective porosity of the Cohassett basalt flow top, the estimates of the Rockwell hydrologists indicate a smaller uncertainty than do the estimates of the independent experts. On the other hand, for the effective porosity and anisotropy ratio of the Cohassett basalt flow interior, the estimates of the Rockwell hydrologists indicate a larger uncertainty than do the estimates of the independent experts.

40351 (USGS-OFR—83-928) **Glacial aquifer systems in the northeastern United States: a study plan.** Lyford, F.P.; Dysart, J.E.; Randall, A.D.; Kontis, A.L. (Geological Survey, Albany, NY (USA)). 1984. 38p. US Geological Survey, Open File Service, Box 25425, Federal Center, Lakewood, CO 80225. File Number TI85901782.

The US Geological Survey in 1982 designed a study of the availability and quality of water in glacial aquifers in the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and Ohio. The study is one of several being conducted nationwide to assemble information on major aquifer systems. The work, scheduled for completion in 1986, focuses on general principles that define aquifer geometry, hydraulic properties, recharge, and discharge; physical-chemical properties of water, interactions between water and rock; and mechanisms for mixing of water from multiple sources. Planned project activities include compilation and analysis of available data for a regional summary of glacial-aquifer systems, studies of selected system components such as recharge and chemical processes, classification of aquifers with regard to water-supply potential, and construction of generalized ground-water models to predict responses of several types of aquifer systems to pumping and climatic stress. This report describes the general characteristics of glacial aquifer systems in the northeastern United States and the planned work elements of the study.

40352 (USGS-OFR—84-427) **Planning report for the comprehensive appraisal of the ground-water resources of the North Coast Limestone Area of Puerto Rico.** Torres-Gonzalez, A.; Wolansky,, R.M. (Geological Survey, San Juan (Puerto Rico). Water Resources Div.). 1984. 36p. US Geological Survey, Open File Services, Box 25425, Federal Center, Denver, CO 80225. File Number TI85901784.

The north coast limestone aquifers are the most productive aquifers in Puerto Rico. The aquifers cover an area of about 600 square miles and are as much as 5600 feet thick at the coast. As of 1980 ground-water withdrawals for municipal, industrial and agricultural supply exceeded 50 million gallons per day. A variety of problems have developed with increasing development, principally water quality degradation and declining water levels. In 1983, the US Geological Survey began a 5-year comprehensive investigation of the ground-water resources of the north coast limestone aquifers. The investigation will include definition of the hydrogeologic framework, geochemistry, and regional flow system, and an assessment of water-quality degradation. The project will include: (1) synthesis of all existing data on regional hydrogeological and geochemical maps, (2) fill data voids with a well inventory, test well drilling and aquifer test program, and (3) design and calibration of a regional ground-water flow digital model of the aquifer system and detailed subregional models of problem areas. Computer simulation will be used to determine the best possible representation of the hydrologic system and to assess the effects of increasing ground-water

withdrawals, sea-water intrusion and waste spills in the aquifers. 19 refs., 9 figs., 1 tab.

40353 **(USGS-OFR—84-637) Mineral resource potential of national forest RARE II and wilderness areas in Montana.** Williams, C.E.; Pearson, R.C. (comps.). (Geological Survey, Denver, CO (USA)). 1984. 155p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901779.

Information on the mineral resource potential of National Forest lands in Montana that are in or are being considered for inclusion in the National Wilderness Preservation System has been compiled to provide a state-wide overview. The report includes a brief description of the status of work, the geology, and the mineral resource potential of each area; it also provides a list of the most pertinent references. The report also includes a 1:1,000,000-scale map that shows the mineral resource potential of each area by means of patterns.

40354 **(USGS-OFR—84-662) Assessment of mineral resources in the Muggins Mountains Bureau of Land Management Wilderness Study Area (AZ-050-53A), Yuma County, Arizona.** Smith, D.B.; Tosdal, R.M.; Adrian, B.M.; Vaughn, R.B. (Geological Survey, Reston, VA (USA)). 1984. 34p. US Geological Survey, Box 25425, Lakewood, CO. File Number TI85901778.

The Muggins Mountains are located within the Basin-and-Range Province of southwest Arizona, some 25 miles east-northeast of Yuma, Arizona. The Muggins Mountains Wilderness Study Area (WSA) encompasses some 25 square miles (16,000 acres) in the southwest part of the range. The oldest rocks in the WSA are marble, micaceous quartzite, and monzogranite which are all thought to be Precambrian in age. The Miocene Kinter Formation, composed of two members, unconformably overlies these rocks. The lower member of the Kinter Formation is made up of sandstone and siltstone interstratified with white tuff having a K-Ar age of 22.5 m.y. (early Miocene). This lower member is intruded by a rhyolite dome. Coarse fanglomerate and minor sandstone of the upper member of the Kinter Formation are interbedded with silicic volcanic flows, domes, and minor tuffs. Unconformably overlying these Miocene sedimentary and volcanic rocks and the Precambrian rocks are several units of late Tertiary and Quaternary deposits of gravel, sand, and silt. Exploration activity within the WSA has involved gold and uranium. Minor gold placers occur south of Klothos Temple and Muggins Peak. The Red Knob uranium prospect is located within the WSA near the eastern boundary, and other small uranium prospects are located just east of the WSA. Based on the geochemical survey, geologic mapping, and past exploration activity, three small areas in the east and southeast portions of the WSA are classified as having moderate potential (3-C classification) for uranium and thorium resources. The remainder of the WSA is classified as having low potential (2-C classification) for metallic minerals, uranium and thorium, nonmetallic minerals, and leasable resources. 29 refs., 6 figs., 5 tabs.

40355 **(USGS-OFR—84-664) Strategy for adoption of accelerator mass spectrometry by the earth sciences.** Doe, B.R.; Brown, L.; Elmore, D.; Herzog, G.; Kruse, T.; Middleton, R.; Morgan, J.; Muller, R.A.; Reynolds, J. (Geological Survey, Reston, VA (USA)). 1984. 38p. US Geological Survey, Open File Service, 25425 Federal Center, Lakewood, CO . File Number TI85901777.

A strategy for the use of accelerator mass spectroscopy by the earth sciences is summarized. (ACR)

40356 **(USGS-OFR—84-711) Ground-water levels in Arkansas, Spring 1984.** Edds, J. (Geological Survey, Little Rock, AR (USA)). 1984. 63p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901807.

The report contains 680 ground-water level measurements made in observation wells in Arkansas in the Spring of 1984. In addition, the report contains well hydrographs relating to the alluvial aquifer and the Sparta Sand and Memphis Sand aquifers, the most important aquifers with respect to ground-water availability and use in Arkansas. 18 refs., 14 tabs.

40357 **(USGS/WRI—83-4038) Water resources on the Pueblo of Laguna, west-central New Mexico.** Risser, D.W.; Lyford, F.P. (Geological Survey, Albuquerque, NM (USA). Water Resources Div.). 1983. 398p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901804.

The Pueblo of Laguna, located on semiarid lands in west-central New Mexico, needs additional quantities of water chemically suitable for public supply and irrigation. This study evaluates the quantity and quality of water available on the Pueblo of Laguna. Ground water for public supply can be found in the valley fill along the Rio San Jose, in the Paguate and Encinal areas, and possibly in the northern part of the Sedillo Grant. Ground water for irrigation is restricted by available well yields and quality to the valley fill along the Rio San Jose and possibly the western part of the Major's Ranch area. 45 refs., 39 figs., 12 tabs.

40358 **(USGS/WRI—83-4178) Availability of water from the alluvial, aquifer in part of the Green River Valley, King County, Washington.** Lum, W.E. II; Alvord, R.C.; Drost, B.W. (Geological Survey, Tacoma, WA (USA)). 1984. 46p. US Geological Survey Open File Services, Box 25425 Federal Center, Lakewood, CO 80225. File Number TI85901796.

The availability of ground water was determined for a 1.56-square-mile area in the Green River valley, Washington, where the Muckleshoot Indian Tribe plans to build a fish hatchery. The tribe intends to use ground water to operate the hatchery. The maximum long-term rate of pumping from a pair of properly constructed 12-inch-diameter wells will total about 144 gallons per minute near the center of the valley and only about 22 gallons per minute near the northern edge. Wells drilled to supply large quantities of water from the alluvium should be located where data indicate the greatest saturated thickness of aquifer materials to be. The water table in the alluvial aquifer ranges from 3 to 15 feet below land surface. The saturated thickness of aquifer materials ranges from 0 to 35 feet. The hydraulic conductivity of the aquifer materials is about 130 feet per day, and the leakage coefficient of the riverbed materials under the Green River is about 1.3 feet per day. Recharge to the aquifer from rainfall is about 10 inches per year. A US Geological Survey two-dimensional ground-water-flow model was calibrated to simulate the ground-water flow system in the study area. Measured water levels in the alluvial aquifer were simulated to within about +-1 foot at 7 of 12 observation well locations and to within +-2 feet at all 12 locations. When pumping from the aquifer was simulated, it was found that all water pumped from wells was derived from induced leakage from the Green River into the alluvium and (or) from water moving through the alluvium to the Green River. Pumping from the alluvial aquifer will reduce the flow of Crisp Creek, but the amount of reduction could not be determined from the data available. 5 refs., 12 figs., 4 tabs.

40359 **(USGS/WRI—83-4219) Hydrogeology of parts of the Central Platte and Lower Loup Natural Resources Districts, Nebraska.** Peckenpaugh, J.M.; Dugan, J.T. (Geological Survey, Lincoln, NE (USA)). 1983. 142p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901799.

Water-level declines of at least 15 feet have occurred in this heavily irrigated area of central Nebraska since the early 1930's, and potential for additional declines is high. To test the effects of additional irrigation development on water levels and streamflow in the area, computer programs were developed that represent the surface-water system, soil zone, and saturated zone of the hydrogeologic system. A two-dimensional, finite difference ground-water flow model of the 3374 square-mile study area was developed and calibrated using steady-state and transient conditions, and three management alternatives were examined. Results indicate that significant additional water-level declines will occur even if there is no additional ground-water development. 35 refs., 18 figs., 22 tabs.

40360 **(USGS/WRI—84-4027) Generalized skew coefficient for flood frequency computations for the state of Hawaii.** Lee, R. (Geological Survey, Honolulu, HI (USA). Water Resources Div.). Jul 1984. 25p. US Geological Survey, Box 25425, Lakewood, CO. File Number TI85901801.

The generalized skew coefficient used in the estimation of flood-flow frequencies for Hawaii streams was set at -0.05 by the Hydrology Committee of the Water Resources Council in 1976. This value was determined by averaging the skew coefficients from 30 gaging stations in Hawaii with at least 25 years of record through water year 1973. Using the Water Resources Council's recommended procedures, a detailed study of skew coefficients for stations in Hawaii was conducted with the following results: (1) there were no discernible geographic or topographic trends when station skew coefficients were plotted on topographic maps; and (2) prediction equations based on regression techniques using basin and climatic characteristics had high standard errors and were not considered reliable. A mean of the skew coefficients for 68 stations was computed to be -0.14, which is not significantly different from the value of -0.05 recommended by the Water Resources Council (1976, 1977, and 1981). Therefore, the general skew coefficient of -0.05 is considered satisfactory for use in the State of Hawaii. Additional studies should be made when more records reach a length of 25 years. 5 refs., 6 figs., 5 tabs.

40361 **(USGS/WRI—84-4037) Evaluation of a hydrograph-shifting method for estimating suspended-sediment loads in Illinois streams.** Frost, L.R. Jr.; Mansue, L.J. (Geological Survey, Urbana, IL (USA). Water Resources Div.). 1984. 42p. US Geological Survey, Box 25425, Lakewood, CO. File Number TI85901802.

A hydrograph-shifting method for estimating monthly and annual suspended-sediment loads was applied to suspended-sediment records for 12 streams in Illinois. Transport equations for each station were obtained from 2 years of suspended-sediment discharge and streamflow data. Synthetic sediment-discharge hydrographs were generated by using the transport equations and daily records of streamflow. These hydrographs were shifted to measured values of daily sediment discharge (control points) selected to represent weekly, biweekly, and monthly sampling frequencies. Estimates of monthly suspended-sediment load ranged from 16 to 326% of measured values. Estimates of annual suspended-sediment loads ranged from 41 to 136% of measured values, which indicates that the method provides a reasonable means of estimating annual loads for most sites. An experiment designed to measure the subjectivity of the method showed it to be more dependent on the particular days selected as control points than on the person applying the method. An evaluation of the effect of the length of record used to develop transport equations on sediment load estimates was not conclusive. Although standard errors of estimate showed no improvement, the comparison of estimated loads with measured loads showed slight improvement when an additional 1 or 2 years of data were added to the first year of data used to develop transport equations. 5 refs., 14 figs., 5 tabs.

40362 **(USGS/WRI—84-4074) Drought-related impacts on municipal and major self-supplied industrial water withdrawals in Tennessee. Parts A and B.** Alexander, F.M.; Keck, L.A.; Conn, L.G.; Wentz, S.J. (Geological Survey, Nashville, TN (USA)). 1984. 424p. US Geological Survey, Open File Service, Box 25425, Federal Center, Lakewood, CO 80225. File Number TI85901795.

During 1981, 463 public community water facilities supplied water to approximately 3,814,000 people or 83% of the 1980 population of Tennessee. Total water supplied was 566.1 million gallons per day of which 346.8 millions gallons per day or 61% was from surface-water sources and 219.3 million gallons per day or 39% was from ground water. Ground water was used for public supply statewide, however, it was the sole source of public supply west of the Tennessee River basin. Of the 219.3 million gallons per day used statewide, 164.0 million gallons per day or 75% was used in West Tennessee. Statewide 129 companies indicated a self-supplied water use of 0.1 million gallons per day or more. The total self-supplied water used by these companies was 1,106.7 million gallons per day of which 1,006.8 million gallons per day or 91% was surface water while 99.9 million gallons per day or 9% was ground water. Analysis of the study results and findings indicates that many communities in Tennessee do experience occasional water-supply, quantity-related shortages. Some type of problem was reported at 107 of the public water suppliers and 23 of the self-supplied commercial and industrial water users. Altogether, 172 problems were reported which could be grouped into 18 types. Occasional turbidity, inadequate storage capacity, inadequate water supply during droughts, and excessive water losses due to leaks in distribution lines accounted for 110 or 64% of the problems reported. Twenty-five or 15% of the problems reported were related to water shortage. Only two large, self-supplied industries reported experiencing water shortage during periods of droughts. Both were located in the Tennessee River basin. No problems were reported by industry in the West Tennessee area or in the Cumberland River basin.

40363 **(USGS/WRI—84-4130) Distribution and occurrence of total coliform bacteria in Floridan aquifer wells, western Lake County, Florida.** Taylor, G.F. (Geological Survey, Tallahassee, FL (USA)). 1984. 29p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901805.

This report presents total coliform bacteria data for Floridan aquifer wells in western Lake County, central Florida. Included are data collected from 1966 to 1979 by the Florida Department of Environmental Regulation for 98 public supply wells, and data collected during 1982 by the US Geological Survey for 29 wells. The data for the 98 public supplies indicate that 85% have a record of total coliform occurrence in the raw water. Data from the 29 wells sampled by the Geological Survey indicate that 55% have a record of total coliform occurrence. Further comparison of the two data sets indicates that the Geological Survey data generally indicate a lower percentage of sites with coliform occurrence and, in some cases, a different pattern of occurrence than did the Department of Environmental Regulation data. 3 refs., 7 figs., 7 tabs.

40364 **(USGS/WRI—84-4142) Estimation of magnitude and frequency of floods in Pima County, Arizona, with comparisons of alternative methods.** Eychaner, J.H. (Geological Survey, Tucson, AZ (USA)). Aug 1984. 71p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901803.

In Pima County, Arizona, a semiarid region of large relief, new regression equations estimate 5- to 100-year flood discharges with standard errors of 42 to 49%. Standard errors for 2- and 500-year discharges are about 60%. Predictor variables are drainage area (0.013 to 4471 square miles), channel slope (0.3 to 13%), and shape factor. Second-order regression models represent the logarithmically nonlinear relations found across the wide range of basin characteristics. Flood estimates are reduced if channel conditions cause large attenuation of peaks. Estimates for gaged sites are a variance-weighted average of estimates from regressions and from gage data. Estimates for the Tucson urban area are based on equations developed in a nationwide study. Research on nonlinear logarithmic regressions and variables that index channel conditions might be useful. Two methods for estimating flood discharges from gage records, two sets of new regressions, and two previously published regional methods are compared. Distribution-free tests against maximum observed floods show differences in accuracy between the methods, and comparisons with base methods show differences in variability. The tests and comparisons indicate that the new equations are more accurate and less variable than methods previously published. 29 refs., 12 figs., 9 tabs.

5802 Geophysics

REFER ALSO TO CITATION(S) 38918, 39363, 40116, 40342

40365 (LBL—16920, pp 111-112) **Seismology: center for computational seismology.** McEvilly, T.V.; Majer, E.L. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40366 (LBL—16920, pp 131-134) **Ideal body method for static earth displacements.** Vasco, D.W. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40367 (LBL—16920, pp 139-142) **CCS/DARPA seismic data base development.** Scherrer, D. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40368 (LBL—16920, pp 92-95) **Cross-hole acoustic measurements in basalt.** King, M.S.; Myer, L.R.; Rezowalli, J. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40369 (LBL—16920, pp 100-103) **Influence of clay-sized particles on seismic velocity in permafrost.** King, M.S. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40370 (LBL—16920, pp 121-124) **Detailed microearthquake studies at Long Valley caldera, California.** Peterson, J.E.; Majer, E.L.; McEvilly, T.V. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40371 (LBL—16920, pp 124-125) **Tau estimates of lateral variations in mantle P-wave velocities.** Tralli, D.M. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40372 (LBL—16920, pp 125-128) **Source parameters of Coalinga aftershocks from a UC Berkeley temporary digital array.** O'Connell, D.R.; Murtha, P.E. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40373 (LBL—16920, pp 129-131) **Seismic attenuation and crustal structure near the San Andreas fault zone from reflection profiling.** Scheiner, J.E. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40374 (LBL—16920, pp 142-146) **Electrical and electromagnetic techniques: electromagnetic soundings in the Long Valley caldera, California.** Goldstein, N.E.; Morrison, H.F.; Wilt, M.J.; Turnross, J. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40375 (LBL—16920, pp 153-155) **Study of the finite-element solution of a 2-1/2 dimensional electromagnetic problem.** Lee, K.H.; Morrison, H.F. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40376 (LBL—16920, pp 155-156) **Accuracy of two line sources for approximating the fields of a large rectangular loop: frequency domain.** Mackiewicz, M.; Morrison, H.F. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40377 (LBL—16920, pp 157-158) **Electromagnetic mapping of sedimentary sections beneath basalt flows.** Morrison, H.F.; Brzeski, J. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40378 (NUREG/CR—4288) **Focal mechanism analyses for Virginia and eastern Tennessee earthquakes (1978-1984).** Bollinger, G.A.; Teague, A.G.; Munsey, J.W.; Johnston, A.C. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Seismological Observatory; Memphis State Univ., TN (USA). Tennessee Earthquake Information Center). Jun 1985. 91p. NTIS, PC E06/MF $5.50 - GPO. File Number TI85901862.

Includes 10 sheets of 24x reduction microfiche.

Focal mechanisms are presented for 11 earthquakes from the Giles County, Virginia, seismic zone and its vicinity and for 12 earthquakes from the Central Virginia seismic zone. These earthquakes ($0 \leq M \leq 4$) were monitored by local networks between January 1978 and October 1984. In Giles County, the data base consists of 43 P-wave polarities and 50 SB to P amplitude ratios (SV/P) that yielded six single event focal mechanisms (SEFM's) and five composite event focal mechanisms (CFM's). In Central Virginia, 79 P-wave polarities and 51 SV/P ratios are used to determine 11 SEFM's and four CFM's. A computer program FOCMEC was used to determine the focal mechanism solutions. The results for the Giles County seismic zone show mainly strike-slip mechanisms on steeply dipping (73° +- 16°) NNE (right lateral motion) and ESE (left lateral motion) trending nodal planes. However, some (4/11) of the solutions show similar movement on nodal planes rotated 45° counterclockwise. The P axes in Central Virginia are generally northeast trending for shallow earthquakes (>8 km) and northwest trending for deeper ones (<8 km). In Giles County, where the seismic activity is occurring beneath the Appalachian decollement, faulting and inferred stress orientations are more uniform than in Central Virginia, some 200 km away, where the seismicity is occurring near and above the decollement. 38 refs., 32 figs., 11 tabs.

40379 (NUREG/CR—4317-Vol.1) **Canadian seismic agreement. Technical report covering, 1979-1985. Volume 1.** Basham, P.W.; Lyons, J.A.; Drysdale, J.A.; Shannon, W.E.; Andersen, F.; Hayman, R.B.; Wetmiller, R.J. (Canadian Commercial Corp., Ottawa, Ontario). Jul 1985. 66p. NTIS, PC A04/MF A01 - GPO. File Number TI85901893.

This Final Report provides a comprehensive summary of the activities of the Earth Physics Branch (EPB) in eastern Canada, particularly with respect to the Eastern Canadian Telemetered Network (ECTN). The report describes the seismographic system developed by EPB to monitor the regional seismicity. There are detailed descriptions of the logic used to select the various physical components of the system, the hardware and software that constitute the recording system, and the data flow from detection to archive. In addition to the engineering details, there is a discusssion of the scientific results from the analysis of the regional seismicity during the reporting period. Particular emphasis has been placed on the Miramichi, New Brunswick earthquakes of January 1982. 35 refs., 27 figs., 5 tabs.

40380 (USGS-OFR—83-235) **Geophysical well logs for eleven drill holes at the Colorado School of Mines Experimental Mine Site, Idaho Springs, Colorado.** Daniels, J.J.; Scott, J.H. (Geological Survey, Denver, CO (USA)). 1983. 49p. US Geological Survey, Open File Services, Box 25425, Denver, CO 80225. File Number TI85901791.

The following geophysical well log measurements were made in eleven drill holes above the Colorado School of Mines Experimental Mines at Idaho Springs, Colorado: (1) acoustic velocity (2) resistivity, (3) caliper, (4) gamma-gamma density, (5) neutron-thermal neutron, (6) gamma ray, (7) induced polarization (IP), (8) self potential (SP), and magnetic susceptibility. The density and acoustic velocity logs indicate extensive fracturing in each of the drill holes. Variations in the relative amount of felsic or mafic mineral components in the rocks can be inferred from the magnetic susceptibility and gamma ray well log responses. Zones containing metallic sulfide mineralization are interpreted from the IP well log response. 6 refs., 20 figs., 11 tabs.

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 38791, 38803, 38816, 38903, 38923

40381 (GSCan-P—83-1A, pp 411-416) **Nonlinear elastic characteristics of granite rock samples from Lac du Bonnet batholith.** Annor, A. (Canada Centre for Mineral and Energy Technology, Ottawa, Ontario); Katsube, T.J. (Geological Survey of Canada, Ottawa, Ontario). 1983. NTIS (US Sales Only), PC A22/MF A01. File Number DE85781277.

In Current research: Part A.

Rocks exhibit a nonlinear elastic behaviour at low stresses. This is due to the presence of pores and microfractures in the rock. This phenomenon has been studied in the past by a number of investigators. An attempt is being made to utilize this phenomenon in characterizing rocks in terms of the effect that stress has on changes in pore structure and, therefore, radio-nuclide migration. This is being accomplished by polynomial regression of the nonlinear stress-strain curves and the development of nonlinear elastic parameters.

40382 (LBL—16920, pp 50-52) **Dependence of fracture mechanical properties on fracture roughness and sample size.** Tsang, Y.W.; Witherspoon, P.A. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40383 (LBL—16920, pp 52-54) **Can water-injection tests reveal the potential for fault movements?.** Noorishad, J.; Witherspoon, P.A. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40384 (LBL—16920, pp 88-92) **Evaluation of technology for detection of anomalies ahead of a tunnel face in basalt.** Myer, L.R.; Majer, E.L. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40385 (LBL—16920, pp 95-96) **Laboratory hydraulic fracturing stress measurements in salt.** Doe, T.W.; Boyce, G. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40386 (LBL—16920, pp 97-100) **Elastic wave velocities in quartz monzonite at different levels of water saturation.** King, M.S. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40387 (UCRL—15699) **Barometric pressure transient testing applications at the Nevada Test Site: formation permeability analysis. Final report.** Hanson, J.M. (Terra Tek Research, Salt Lake City, UT (USA)). Dec 1984. Contract W-7405-ENG-48. 281p. NTIS, PC A13/MF A01; 1; GPO Dep. File Number DE85016078.

The report evaluates previous investigations of the gas permeability of the rock surrounding emplacement holes at the Nevada Test Site. The discussion sets the framework from which the present uncertainty in gas permeability can be overcome. The usefulness of the barometric pressure testing method has been established. Flow models were used to evaluate barometric pressure transients taken at NTS holes U2fe, U19ac and U20ai. 31 refs., 103 figs., 18 tabs. (ACR)

5804 Geochemistry

REFER ALSO TO CITATION(S) 38800, 38820, 38910, 38911, 39648, 39649, 39658, 39659, 40333

40388 (GSCan-P—83-1B, pp 303-307) **Uranium and base metal concentrations in till samples from northern Manitoba.** Dredge, L.A. 1983. NTIS (US Sales Only), PC A20/MF A01. File Number DE85781278.

In Current research: Part B.

Histograms and a summary map show regional background, mean, and anomalous concentrations of uranium and ten base metals in the Late Wisconsin till sheet of northern Manitoba. Isolated anomalies occur in tills overlying all rock types, but clusters of associated elemental anomalies are found in granodiorites at Caribou River, gneisses at Snyder Lake and Ballantyne Lake, and volcanics at Great Island. Anomalies in sandy till (northern provenance) indicate nearby bedrock characteristics; those in silty till (eastern provenance) apparently are unrelated to the underlying bedrock.

40389 **(GSCan-P—84-1B) Current research: Part B.** (Geological Survey of Canada, Ottawa, Ontario). 1984. 439p. NTIS (US Sales Only), PC A19/MF A01. File Number DE85781279.

Selected papers have been processed for inclusion in the Energy Data Base. (ATT)

40390 **(INIS-BR—262) Statistical treatment of geochemical data and its application in the geologic mapping and in the definition of the geochemical anomalies in the Alvo 2-Corpo 4 -Provincia Mineral de Carajas.** Moura, C.A.V. (Para Univ., Belem (Brazil)). 1982. 119p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781511.

Thesis.

It was given a statistical treatment for the geochemical data about soil in the are named Alvo2 - Corpo4- in the Provincia Mineral de Carajas, Para, Brazil, for application of the geological mapping and definition of geochemical anomalies. (A.B.).

40391 (LBL—16920, pp 167-169) **Thermodynamic properties of silicate materials.** Carmichael, I.S.E.; Bishop, F.C.; Lange, B.; Mo, X.; Rivers, M.L.; Stebbins, J.F. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40392 (LBL—16920, pp 177-180) **Effect of a second-order rate of interphase mass transfer on advective/dispersive solute transport in porous media.** Remer, J.S.; Carnahan, C.L. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40393 (LBL—16920, pp 180-183) **Galena/dichromate solution interaction and the nature of the resulting chromium(III) species: an important reaction system in the froth flotation processing of galena.** Perry, D.L.; Tsao, L. Jul 1984. NTIS, PC A11/MF A01. File Number DE85001036.

In Earth Sciences Division annual report 1983.

40394 **(USGS-OFR—83-344) Spectrographic and chemical analyses of rock and soil samples from the Medford 1° x 2° quadrangle, Oregon-California.** Whittington, C.L.; Grimes, D.J.; Peterson, J.A. (Geological Survey, Denver, CO (USA)). 1983. 235p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901780.

The report presents analytical and location data on 3146 rock and 35 soil samples from the Medford 1° x 2° quadrangle, Oregon-California. These data are compiled from mineral resource and geochemical studies in the quadrangle and from similar studies of wilderness areas lying partly or entirely within the quadrangle: the Wild Rogue Wilderness, the Kalmiopsis Wilderness, and the Sky Lakes Roadless Area and Mountain Lakes Wilderness. 14 refs., 2 tabs.

40395 **(USGS-OFR—83-349) Analytical results of stream-sediment samples from the Medford 1° x 2° quadrangle, Oregon-California.** Whittington, C.L.; Leinz, R.W.; Speckman, W.S. (Geological Survey, Denver, CO (USA)). 1983. 157p. US Geological Survey, Box 25425, Lakewood, CO 80225. File Number TI85901783.

The report presents analytical and location data of 1529 stream-sediment samples and their oxide residues (oxalic-acid leachates) from the Medford 1° x 2° quadrangle, Oregon-California. These samples were collected during a geochemical survey of the quadrangle and during mineral resource and geochemical studies of wilderness areas lying partly or entirely within the quadrangle including the Wild Rogue Wilderness, the Kalmiopsis Wilderness, and the Sky Lakes Roadless Area and Mountain Lakes Wilderness. 12 refs., 2 tabs. (ACR)

40396 **Dating technique tested.** *Analytical Chemistry;* **57**: No. 4, 548A-550A(Apr 1985).

An analytical technique for dating ground water and polar ice up to a million years old has been successfully tested by scientists at Oak Ridge National Laboratory (ORNL). The system, known as a rare gas atom counter, extends the capabilities of resonance ionization mass spectrometry to include counting single atoms of krypton-81. The counter is composed of a pulsed dye laser operated in tandem with a mass spectrometer to separate the various isotopes of krypton. In a collaborative study, ORNL scientists recently used the method for the first time to count krypton-81 in a liter of ground water removed from a sandstone aquifer near Zurich. Fewer than 1000 krypton-81 atoms were isolated from the ground water samples. According to Bernard Lehman, a collaborating geochemist at the University of Bern, this first test proved that counting the small numbers of krypton-81 atoms necessary to make an estimate of the age of water could actually be done. Among the applications of this method, Lehman says, could be improved siting of locations for the disposal of radioactive wastes.

40397 **Oxide solution mechanisms in silicate melts: systematic variations in the activity coefficient of SiO_2.** Ryerson, F.J. (Univ. of California, Livermore). *Geochimica et Cosmochimica Acta;* **49**: No. 3, 637-649(Mar 1985).

Phase equilibria and spectroscopic data are used to develop a simple model for the interaction of various oxide components and molten SiO_2. Network modifying oxides, M/sub x/O/sub y/ produce nonbridging oxygens thereby depolymerizing the SiO_2 network. The energetics of nonbridging oxygen formation are least favorable when the field strength of the metal cation is high. This produces relatively strong M-O and Si-O-Si bridging bonds at the expense of weaker Si-O-M bonds. This relationship is manifested by an increase in positive deviations from ideality with increasing cation field strength in M/sub x/O/sub y/-SiO_2 systems; the activity coefficient of SiO_2 is inversely correlated with Si-O-M bond strength. Network forming oxides may copolymerize with the SiO_2 network. Mixing on the same quasi-lattice produces solutions which approach ideality. Deviations from ideality in such solutions can be linked to distortions in the SiO_2 network. Discrete anion formers complex with metal oxides other than SiO_2 to form discrete structural units which do not copolymerize with SiO_2. The SiO_2 network is essentially shielded from the high charge density cations in such systems and unmixing is common. It is important to recognize that oxides such as P_2O_5, TiO_2 and ZrO_2 may act as either network-formers or discrete anion formers depending upon melt composition, and are probably distributed between these two sites in most geologically important liquids. The latter structural role is favored in more basic compositions. 80 references, 8 figures.

40398 **Chemistry of potassium feldspars from three zoned pegmatites, Black Hills, South Dakota: implications concerning pegmatite evolution.** Shearer, C.K.; Papike, J.J.; Laul, J.C. (South Dakota School of Mines, and Technology, Rapid City). *Geochimica et Cosmochimica Acta;* **49**: No. 3, 663-673(Mar 1985). Contract AC06-76RL01830;AS03-82ER12040.

An initial phase of an extensive geochemical study of pegmatites from the Black Hills, South Dakota, indicates potassium feldspar composition is useful in interpreting petrogenetic relationships among pegmatites and among pegmatite zones within a single pegmatite. The K/Rb and Rb/Sr ratios and Li and Cs contents of the feldspars within each zoned pegmatite, to a first approximation, are consistent with the simple fractional crystallization of the potassium feldspar from a silicate melt from the wall zone to the core of the pegmatites. Some trace element characteristics (i.e. Cs) have been modified by subsolidus reequilibration of the feldspars with late-stage residual fluid. K/Rb ratios of the potassium feldspar appear to be diagnostic of the pegmatite mineral assemblage. The relationship between K/Rb and mineralogy is as follows: Harney Peak Granite (barren pegmatites) > 180; Li-Fe-Mn phosphate-bearing pegmatites = 90-50; spodumene-bearing pegmatites = 60-40; pollucite-bearing pegmatites < 30. Although the K/Rb ratios suggest that the pegmatites studied are genetically related by fractional crystallization to each other and the Harney Peak Granite, overlapping Rb/Sr ratios and the general increase in Sr and Ba with decreasing K/Rb indicate the genetic relationship is much more complex and may also be dependent upon slight variations in source (chemistry and mineralogy) material composition and degrees of partial melting. 35 references, 8 figures, 3 tables.

5805 Oceanography

REFER ALSO TO CITATION(S) 38927

64 PHYSICS I

6401 Astrophysics And Cosmology

REFER ALSO TO CITATION(S) 40488

40399 **(FNAL/C—85/86-A) Black holes, pregalactic stars, and the dark matter problem.** Carr, B.J. (London Univ. (UK). School of Mathematical Sciences; Fermi National Accelerator Lab., Batavia, IL (USA)). Jun 1985. Contract AC02-76CH03000. 40p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015385.

We review the different ways in which black holes might form and discuss their various astrophysical and cosmological consequences. We then consider the various constraints on the form of the dark matter and conclude that black holes could have a significant cosmological density only if they are of primordial origin or remnants of a population of pregalactic stars. This leads us to discuss the other cosmological effects of primordial black holes and pregalactic stars. 239 refs., 7 figs., 5 tabs.

40400 **(INPE—2617) Microwave and X-Ray emission during a isentropic expansion and its application to solar bursts.** Piazza, L.R. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). Jan 1983. 196p. (In Portuguese). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781042.

The gyro-synchrotron emission in microwaves and the free-free emission in X-rays of a plasma enclosed in a cylinder coincident with a magnetic force tube were calculated for an isentropic self-similar expansion, with plane and cylindrical symmetries. This expansion model was applied to a region of the low solar corona, and the results were compared to the emission observed in some simple solar events of low intensity. The calculations show satisfactory coincidence with the events in X-rays for energies around 10^{29} ergs. The solar events analyzed in microwaves, which are not the same that were studied in X-rays, in general do not fit the theoretical results. The origin of the discrepancy is probably the formulation of the processes of emission applied to the expansion.

40401 **(INPE—2743) Oscillator phenomena in the solar atmosphere and radiation modulation in microwaves.** Vaz, A.M.Z. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). May 1983. 97p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE85781043.

An overview of the principal known descriptions of oscillations in the solar atmosphere at different ranges of periods was developed. Particular attention was given to oscillations with time

scale of seconds, associated to active regions or bursts. 1.5 quasi-periodic oscillations were detected by the first time at more than one microwave frequency simultaneously (22 GHz and 44 GHz), with high sensitivity and high time resolution, superimposed on a burst on Dec. 15, 1980. An advance phase of 0,3s between the oscillations in the frequencies of 22 GHz and 44 GHz was discovered. The proposed mechanism to explain such oscillations is based on oscillations of the magnetic field at the source. These oscillations modulate the gyro-synchrotron emission from high energy electrons trapped in the magnetic structure. The phase difference is attributed to the influence of the optical thickness of the gyro-synchrotron emission at 22 GHz.

40402 **(INPE—2907) Observations of galactic center for annihilation line at 0.511 MeV.** Jayanthi, U.B.; Martin, I.M.; Braga, J.; Neri, J.A.C.F.; Jardim, M.V.A.; Rao, K.R. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). Oct 1983. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781044.

The presence of the 0.511 MeV gamma line emission from galactic center is well-established from various balloon experiments. Recent results in 1980-82 from balloon and satellite experiments show significant decrease in this line intensity. To confirm these results a balloon flight is performed with a large area sodium iodide detector to measure 0.511 MeV line from galactic center. The preliminary results indicate flux $<2.2 \times 10^{-3}$ photons $cm^{-2} s^{-1}$.

40403 **(ITA-PS—1) Photo cross-sections for stellar atmosphere calculations - Compilation of references and data.** Mathisen, R. (Oslo Univ. (Norway). Inst. for Teoretisk Astrofysikk). Sep 1984. 63p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781056.

Photo cross-section data for continuum absorption and scattering processes of importance to stellar model atmosphere calculations are reviewed, and the results of an evaluation of the most reliable cross-section data available are presented. The paper contains two parts. In part I a compilation of references to recent work on photo cross-sections is given. Part II contains a selected set of cross-section data. It is believed that reliable data for most continuum processes, operating in normal stellar atmospheres, are included. The data are presented in a way easy to use in practical model calculations.

40404 **(ITEP—109(1984)) Cosmological problems for spontaneously broken supergravity.** Goncharov, A.S.; Linde, A.D.; Vysotsky, M.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1984. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701764.

Cosmological consequences of the elementary particle theories based on the spontaneously broken N=1 supergravity are investigated. Almost all such theories considered up to now prove to be in a conflict with cosmology. It is shown that in most of the theories this conflict is not resolved even with the hel inflation. 11 references.

40405 **(ITF—83-141-R) Towards hydrogen emission in filamentary prominences.** Zharkova, V.V. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1983. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701762.

The structurally inhomogeneous prominence models with the filamentary degree $\gamma = 0.00\text{-}0.99$ are considered. The emission transfer equations in hsub(α), ls b(α) and lsub(c) - frequencies are solved together with the level steady ones for m = 2-5 and continuum. The distributions with optical depth of the relative second level populations and emission measures of hydrogen atom are obtained as the lsub(α)-line profiles and the lsub(α)-line full intensities to be coincident with the observed values for the features of $\gamma = 0.30\text{-}0.70$. 8 referenecs, 19 figures.

40406 **(ITF—83-170-R) Fluctuations in the inflationary Fridmannian Universe.** Beletskij, Yu.A. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1984. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701765.

The evolution of the energy density perturbation in the early Universe for the equation of state of a general form is considered. The obtained results are used to analyse the development of perturbations in the inflationary Universe. 30 references, 4 figures.

40407 **(ITF—84-65-R) Nature of giant lubbles of the Cygnus X source type.** Silich, S.A.; Fomin, P.A. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1984. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701763.

An observational criterion for selecting between two models (single supernova explosion or supernova cascade process) of the origin of giant bubbles of the Cygnus X source type is proposed. It is based on qualitative difference of x-ray radial brightness distribution in these two cases. 24 references, 5 figures, 1 table.

40408 (JINR—D-2-13-83-689, pp 129-132) **Laser-interferometric detector of gravitational radiation.** Alekseev, A.D.; Kolosnitsyn, N.I. (Vsesoyuznyj Nauchno-Issledovatel'skij Tsentr po Izucheniyu Svojstv Poverkhnosti i Vakuuma, Moscow, USSR). 1983. (In Russian). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780874. (CONF-8306179—).

From Working meeting on problems of radiation and detection of gravitational waves; Dubna, USSR (7 Jun 1983).

Possibility of using a laser-interferometric detector on the base of the Fabry-Perot interferometer for detecting gravitational radiation is considered. Characteristics of this gravitational detector are discussed. It is shown that for the Fabry-Perot interferometer with base L=10 m and reflection coefficient R=0.95 the band width of each resonance is equal 455 kHz, while the region of detecting low frequencies-0-247 kHz. With increase of mirror reflection coefficient up to R=0.998 resonances are narrowed up to the band width 178 kHz. The low-frequency detection region constitutes 0-889 kHz. Sensitivity is increased 25 times. 3 references.

40409 (JINR—D-7-83-644, pp 558-560) **Search and identification of superheavy cosmic nucleus tracks in olivine of the extraterrestrial origin.** Perelygin, V.P.; Stetsenko, S.G.; Otgonsurehn, O. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Superheavy cosmic nuclei in olivine of the extraterrestrial origin are searched. Tracks of superheavy nuclei of the galactic origin in meteorite crystals are investigated (1973-1979). To identify tracks of nuclei with >50 up to Z=120 (1980-1983), the technique of selective thermal effect on olivine crystals is applied. In the track length spectrum measured a group of the length 180-230 μm can be singled oUt. This group correspoinds, according to extrapolation in the framework of the Kats-Kobetich model to tracks of nuclei of thoriUm-uranium group. The relative abundance of this group of tracks as compared with the abundance of nuclei of the iron group is $(1.5\text{-}2) \times 10^{-7}$%. In experiments with Marialachti and Eagle Station olivines 4 tracks of the length 340-365 μm have been found. The relative abundance of anomalously stretched tracks to the tracks of nuclei of thorium-uranium group is $(5+-3) \times 10^{-3}$.

40410 (JINR—D-7-83-644, pp 580-588) **Possibility of solar neutrino detection according to long-lived reaction products by means of laser radiation.** Flerov, G.N.; Gangrskij, Yu.P.; Markov, B.N.; Nadzhakov, E.G.; Oganesyan, Yu.Ts. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The possibility of preparing experiments on measuring a flux of solar neutrinos is discussed. Neutrino detection is based on counting of atoms producing in reactions of neutrino interaction

with nuclei of different elements that are included in the composition of Earth Samples. The selection of the series of long-lived products of these reactions (^{41}Ca, ^{53}Mn, ^{59}Ni, ^{81}Kr, ^{97}Tc, ^{137}La, ^{163}Ho, ^{205}Pb) with half-life periods of 10^4-10^7 years is explained. Cross sections of reactions for different components of the solar neutrino spectrum and the yield of above isotopes are presented. The method of counting of single atoms of these isotopes using laser radiation is considered.

40411 (LA-UR—85-1979) Preparation, analysis, and release of simulated interplanetary grains into low earth orbit. Stephens, J.R.; Strong, I.B.; Kunkle, T.D. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 7p. (CONF-850287—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014133.

From Workshop on the inter-relationship among interstellar, circumstellar, and interplanetary grains; Wye, MD, USA (27 Feb 1985).

Astronomical observations which reflect the optical and dynamical properties of interstellar and interplanetary grains are the primary means of identifying the shape, size, and the chemistry of extraterrestrial grain materials and is a major subject of this workshop. Except for recent samplings of extraterrestrial particles in near-Earth orbit and in the stratosphere, observations have been the only method of deducing the properties of extraterrestrial particles. Terrestrial laboratory experiments typically seek not to reproduce astrophysical conditions but to illuminate fundamental dust processes and properties which must be extrapolated to interesting astrophysical conditions. In this report, we discuss the formation and optical characterization of simulated interstellar and interplanetary dust with particular emphasis on studying the properties on irregularly shaped particles. We also discuss efforts to develop the techniques to allow dust experiments to be carried out in low-Earth orbit, thus extending the conditions under which dust experiments may be performed. The objectives of this study are threefold: (1) Elucidate the optical properties, including scattering and absorption, of simulated interstellar grains including SiC, silicates, and carbon grains produced in the laboratory. (2) Develop the capabilities to release grains and volatile materials into the near-Earth environment and study their dynamics and optical properties. (3) Study the interaction of released materials with the near-Earth environment to elucidate grain behavior in astrophysical environments. Interaction of grains with their environment may, for example, lead to grain alignment or coagulation, which results in observable phenomena such as polarization of lighter or a change of the scattering properties of the grains.

40412 (LA-UR—85-1990) Use of chemical explosives for emergency solar flare shelter construction and other excavations on the Martian surface. Dick, R.D.; Blacic, J.D.; Pettitt, D.R. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 15p. (CONF-8506149—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014131.

From Manned mars mission workshop; Huntsville, AL, USA (10 Jun 1985).

The necessity to shelter people on the Martian surface from solar flare particles at short notice and the need for long-term habitats with thick cosmic ray shielding suggests that explosives could be used effectively for excavation of such structures. Modern insensitive high explosives are safe, efficient, and reliable for rock breakage and excavation. Extensive Earth-bound experience leads us to propose several strategies for explosively-constructed shelters based on tunneling, cratering, and rock casting techniques.

40413 (LA-UR—85-2005) X-ray observations of gamma-ray bursts. Laros, J.G.; Katoh, M.; Murakami, T. (Los Alamos National Lab., NM (USA)). Jul 1984. Contract W-7405-ENG-36. 18p. (CONF-8407130—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014126.

From Conference on gamma-ray bursts; Palo Alto, CA, USA (30 Jul 1984).

As of this writing, all existing simultaneous x-ray observations of gamma-ray bursts (that is, observation having useful sensitivity below 30 keV at the time of the burst) have been serendipitous. Otherwise stated, there has never been a true GRB instrument designed to collect data in the <30 keV regime. Consequently, all the x-ray measurements have been compromised to some extent by experimental configurations not intended for GRB observations. Until recently, the experimental picture was further complicated by the fact that bursts were not well characterized even at gamma-ray energies. It is therefore not surprising that a reasonable observational understanding of the x-ray emission from GRBs has been difficult to attain. 7 refs., 9 figs.

40414 (UCRL—92789) Production and survival of ^{99}Tc in He-shell recurrent thermal pulses. Takahashi, K.; Mathews, G.J.; Ward, R.A.; Becker, S.A. (Lawrence Livermore National Lab., CA (USA); Los Alamos National Lab., NM (USA)). 30 May 1985. Contract W-7405-ENG-48. 10p. (CONF-850375—12). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014182.

From 20. Recontre de Moriond; Les Arcs, France (10 Mar 1985).

After a brief introduction to the present state of art of nuclear beta-decay studies in astrophysics, we report our recent work on the long-standing ^{99}Tc problem. Having combined a detailed study of the recurrent He-shell thermal-pulse, third dredge-up episodes in a 2.25 M/sub solar/ star and an s-process network calculation, we show that a substantial amount of ^{99}Tc can be produced by the s-process and can survive to be dredged up to the stellar surface. We stress that the factual observation of ^{99}Tc at the surface of certain stars does not necessarily preclude the ^{22}Ne(α,n)^{25}Mg reaction from remaining as the neutron source for the s-process. The calculated surface abundances of ^{99}Tc and elements with neighboring atomic numbers are compared with observations. 43 refs., 5 figs.

40415 (UCRL—92912) Transition radiation and coherent electron-photon scattering. Moran, M.J. (Lawrence Livermore National Lab., CA (USA)). Apr 1985. Contract W-7405-ENG-48. 16p. (CONF-850484—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014813.

From Penetration phenomena workshop; Oak Ridge, TN, USA (14 Apr 1985).

Relativistic electron irradiation of thin solid targets is known to generate collimated beams of x-ray photons in the forward direction by a number of different processes. A variety of mechanisms are discussed that share common characteristics in the angular and spectral distributions of the generated photon beams. Some simple physical explanations are offered for the characteristics shared by these processes. Some examples are then given based on experimental results attained at the LLNL electron-positron accelerator. (LEW)

40416 Passage of a "Nemesis"-like object through the planetary system. Hills, J.G. (Los Alamos National Laboratory, Theoretical Division, T-6, Mail Stop B288, Los Alamos, New Mexico 87545). *Astronomical Journal;* **90**: No. 9, 1876-1882(Sep 1985).

The probability that passing stars could have perturbed the hypothetical stellar companion, Nemesis, into an orbit that penetrates the planetary system is about 15%. The planetary orbits crossed by Nemesis would become highly eccentric, and some would even become hyperbolic. If Nemesis ejects Jupiter from the solar system, the semimajor axis of the orbit of Nemesis would shrink down to a few hundred AU. The probability of any object in the inner edge of the Oort cloud at a semimajor axis of 2×10^4 AU having passed inside the orbit of Saturn is about 80%. The apparent lack of damage to the planetary orbits implies a low probability of there being any objects more massive than 0.02 M/sub sun/ in the inner edge of the Oort comet cloud. However, several objects less massive than 0.01 M/sub sun/ or 10 Jupiter masses could pass through the planetary system from the Oort cloud without causing any significant damage to the planetary orbits. The lack of damage to the planetary system also requires that no black dwarf more massive than 0.05 M/sub sun/ has entered the planetary system from interstellar space.

40417 **Comment on "Microwave background anisotropy and decaying-particle models for a flat universe".** Turner, M.S. (NASA/Fermilab Astrophysics Center, Fermi National Accelerator Laboratory, P.O. Box 500, Batavia, Illinois 60510). *Physical Review Letters;* **55**: No. 5, 549-549(29 Jul 1985).

A Comment on the Letter by N. Vittorio and J. Silk, Phys. Rev. Lett. 54, 2269 (1985).

40418 **Polar cap photoionization and the ten-hour clock at Jupiter.** Goertz, C.K.; Baker, D.N. (Department of Physics and Astronomy, The University of Iowa, Iowa City). *Journal of Geophysical Research;* **90**: No. A7, 6304-6310(1 Jul 1985).

We show that the clocklike modulation of the spectral index of energetic electrons (>2 MeV) in the outer Jovian magnetosphere is due to a periodic shift of the particle energy spectrum toward higher and lower energies. This shift results in a modulation of the spectral index when the spectrum is not a pure power law in energy. We suggest that the periodic energization is due to a periodic modulation of the magnetic field in the outer magnetosphere. This modulation is caused by a variation of the longitudinally averaged Pedersen conductivity due to the asymmetric solar illumination of the trace of the magnetodisc in the high-latitude ionospheres. Such a modulation requires the presence of a surface magnetic anomaly.

40419 **Recent heavy-particle decay in a matter-dominated universe.** Olive, K.A.; Seckel, D.; Vishniac, E. (Theoretical Astrophysics Group, Fermi National Accelerator Laboratory). *Astrophysical Journal;* **292**: No. 1, 1-11(1 May 1985).

The cold-matter scenario for galaxy formation solves the dark-matter problem very nicely on small scales corresponding to galaxies and clusters of galaxies. It is, however, difficult to reconcile with a universe with an Einstein-deSitter value of $\Omega = 1$. We will show here that cold matter and $\Omega = 1$ can be made compatible while retaining the feature that the universe is matter-dominated today. This is done by means of heavy (cold) particles whose decay subsequently leads to the unbinding of a large fraction of lighter clustered matter.

40420 **Two-phase accretion model for emission-line regions in quasars and active galactic nuclei.** Wandel, A.; Yahil, A.; Milgrom, M. (Princeton University Observatory). *Astrophysical Journal;* **292**: No. 1, 206-216(1 May 1985). Contract AC02-80ER10719.

A model is constructed for the broad-line region of quasars and active galactic nuclei. A two-phase medium, made of cool photoionized filaments embedded in a hot gas, and assumed to be in a quasi-spherical infall, is producing the line emission, as well as supplying the mass needed to power the central continuum source. Taking into account conduction and radiative cooling in the filaments, an asymptotic solution is found, in which the ionization parameter in the clouds is almost independent of the distance from the central source. This can reproduce the observed feature that lines of different excitation levels have similar profiles. A new relation is found between the efficiency of the central source and the dimensionless accretion rate, and the efficiency is expressed in terms of observable quantities. The observational data on the emission lines imply high central masses, 10^7—10^{10} M/sub sun/; high accretion rates, $0.3 < M < 10^3$M/sub sun/ yr^{-1}; and low efficiencies, e< or ≈ 0.001.

40421 **Recurrent novae as a consequence of the accretion of solar material onto a 1.38 M/sub sun/ white dwarf.** Starrfield, S.; Sparks, W.M.; Truran, J.W. (Department of Physics, Arizona State University; and Theoretical Division,Los Alamos National Laboratory). *Astrophysical Journal;* **291**: No. 1, 136-146(1 Apr 1985).

We have computed three evolutionary sequences which treat the accretion of hydrogen-rich material onto 1.38 M/sub sun/ white dwarfs. In each of these sequences the accreting matter had only a solar composition of the CNO nuclei (Z = 0.015). In the first sequence we utilized an accretion rate of 1.7 x 10/sup hyphen8/ M/sub sun/ yr/sup hyphen1/ onto a white dwarf with an initial luminosity of 0.1 L/sub sun/ . It took this sequence '33 yr to reach the peak of the thermonuclear runaway which resulted in an outburst that ejected 3x10/sup hyphen8/ M/sub sun/ . of material moving at speeds up to 2900 kn s/sup hyphen1/. The light curve, the time to outburst, and the amount of mass ejected during the evolution are in excellent agreement with the observed outburst of Nova U Sco 1979. However, only 6% of the accreted envelope was ejected during the outburst. The remaining material quickly burned to helium ('2 yr) and settled back onto the white dwarf. The second study involved an accretion rate of 1.7x10/sup hyphen9/ M/sub sun/ yr/sup hyphen1/ onto a white dwarf with an initial luminosity of 10/sup hyphen2/ L/sub sun/ . It took nearly 1600 yr to reach the burst phase of the evolution, and by this time the dwarf had accreted '3x10/sup hyphen6/ M/sub sun/ . Peak temperature in the shell source reached 3.5×10^8 K, about 1.3×10^8 K higher than was found for model 1. This sequence ejected 3x10/sup hyphen7/ M/sub sun/, only 13% of the accreted envelope, moving at low velocities. For both of these evolutionary sequences, we find that as a result of the accretion of matter onto a massive white dwarf, the mass of the white dwarf grows toward the Chandrasekhar limit. If our study is a realistic representation of the evolution of U Sco, then this star is well on its way to becoming an SN I.

40422 **Convective heating of the inner core of red giants prior to the peak of the core helium flash.** Cole, P.W.; Demarque, P.; Deupree, R.G. (Yale University Observatory). *Astrophysical Journal;* **291**: No. 1, 291-296(1 Apr 1985).

The effects of convective overshooting across the temperature inversion in the cores of red giants are investigated from the onset of the core convection zone to the peak of the core helium flash using a model for overshooting in stellar evolution, based on two-dimensional and three-dimensional hydrodynamic simulations of the core helium flash. A major effect of the overshooting is the substantial heating of the material interior to the temperature inversion, producing a smoother temperature profile. This interior heating is thus unimportant until approximately 1 week preceding the time of maximum temperature, but then produces temperature changes on a time scale short with respect to the evolution time scale. Interior heating (1) alters the standard relation of the maximum temperature and the density at the point of maximum temperature, (2) makes the maximum temperature occur at a smaller mass fraction, (3) causes the time of maximum temperature to occur hundreds of years earlier in the red giant evolution, and (4) redistributes the mass from the location of maximum temperature. Since the degree of degeneracy is known to affect the violence of the flash in the hydrodynamic phase, internal heating may play an important role in determining the subsequent evolution of the core.

40423 **Numerical simulations of stellar convective dynamos. II. Field propagation in the convection zone.** Glatzmaier, G.A. (Los Alamos National Laboratory). *Astrophysical Journal;* **291**: No. 1, 300-307(1 Apr 1985).

We present numerical simulations of nonlinear, three-dimensional, time-dependent, giant-cell stellar convection and magnetic field generation. The velocity, magnetic field, and thermodynamic variables satisfy the anelastic magnetohydrodynamic equations for a stratified, rotating, spherical shell of ionized gas. The interaction of rotation and convection produces a nonlinear transport of angular momentum that maintains a differential rotation in radius and latitude. At the surface, our simulated angular velocity peaks in the equatorial region in agreement with Doppler measurements of the solar surface rotation rate; below the surface, it decreases with depth in agreement with what is inferred from the rotational frequency splitting of solar oscillations. The interaction of rotation and convection also maintains left-handed helical fluid motions in the northern hemisphere and right-handed motions in the southern hemisphere. Magnetic fields are generated by the shearing and twisting effects of the differential rotation and helical motions and are destroyed by eddy diffusion. They in turn feedback onto the velocity and thermodynamic fields via the Lorentz force and Joule heating. Although we have not continued the computation long enough to simulate a complete magnetic cycle, our solutions demonstrate how the induced magnetic fields propagate away from the equator in the opposite direction inferred from the solar butterfly diagram. We suggest that, instead of operating in the turbulent convective region, the solar dynamo may be operating at the base of

the convection zone where our simulated helicity has the opposite sign and a smaller amplitude.

40424 **Shadow world of superstring theories.** Kolb, E.W.; Turner, M.S.; Seckel, D. (NASA/Fermi National Accelerator Lab., Batavia, IL). *Nature (London);* **314**: 415-419(Apr 1985).

Some possible astrophysical and cosmological implications of shadow matter, a form of matter which only interacts gravitationally with ordinary matter and which may or may not be identical in its properties to ordinary matter, are considered. The possible existence, amount, and location of shadow matter in the solar system are discussed, and the significance of shadow matter for primordial nucleosynthesis, macroscopic asymmetry, baryogenesis, double-bubble inflation. and asymmetric microphysics is addressed. Massive shadow states are discussed. 29 references.

40425 **Some investigations about the Carson opacities.** Cox, A.N.; Kidman, R.B. (Los Alamos National Lab., NM (USA)). pp 41-46 of Observational tests of the stellar evolution theory. Proceedings of the IAU symposium No. 105 held in Geneva, Switzerland, September, 12-16, 1983. Maeder, A. (Geneva Observatory, Sauverny (Switzerland)); Renzini, A. (Bologna Univ. (Italy)) (eds.). Dordrecht, Netherlands; D. Reidel (1984). (CONF-8309172—).

From IAU symposium on observational tests of stellar evolution theory; Geneva, Switzerland (12 Sep 1983).

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Accurate opacities for stellar composition mixtures are needed for all studies of stellar structure, evolution, stability, and pulsation. In several cases it appears that larger opacities in the range of temperature near one million Kelvin would assist in resolving some current discrepancies between observations of stars and some theoretical predictions. Opacities published by Carson, Mayers, and Stibbs (1968) and more recently modified have this larger opacity in this temperature region compared to the widely used Los Alamos opacities. It is therefore of great interest to see if the actual cause of the differences between these two sets of opacities can be found and discussed.

40426 **Comparisons between observational color-magnitude diagrams and synthetic cluster diagrams for young star clusters in the Magellanic Clouds.** Recker, S.A.; Brunish, W.M. (Los Alamos National Lab., NM (USA)); Mathews, G.J. (Lawrence Livermore National Lab., CA (USA)). pp 83-87 of Observational tests of the stellar evolution theory. Proceedings of the IAU symposium No. 105 held in Geneva, Switzerland, September, 12-16, 1983. Maeder, A. (Geneva Observatory, Sauverny (Switzerland)); Renzini, A. (Bologna Univ. (Italy)) (eds.). Dordrecht, Netherlands; D. Reidel (1984). (CONF-8309172—).

From IAU symposium on observational tests of stellar evolution theory; Geneva, Switzerland (12 Sep 1983).

Also published in paperback ISBN 90-277-1775-3.

Young star clusters ($<3 \times 10^8$ yr) in the Magellanic Clouds (MC) can be used to test the current status of the theory of stellar evolution as applied to intermediate and massive stars. The color-magnitude diagram of many young clusters in the MC shows large numbers of stars in both the main sequence and post main sequence evolutionary phases. Using a grid of stellar evolution models, synthetic cluster H-R diagrams are constructed and compared to observed color-magnitude diagrams to determine the age, age spread, and composition for any given cluster. In addition, for those cases where the data is of high quality, detailed comparisons between theory and observation can provide a diagnostic of the accuracy of the stellar evolution models. Initial indications of these comparisons suggest that the theoretical models should be altered to include: a larger value for the mixing length parameter, a larger rate of mass loss during the asymptotic giant branch phase, and possibly convective overshoot during the core burning phases.

40427 **Role of the radiation pressure gradient in giant and supergiant star evolution.** Brunish, W.M.; Cox, A.N.; Becker, S.A.; Despain, K.H. (Los Alamos National Lab., NM (USA)). pp 89-91 of Observational tests of the stellar evolution theory. Proceedings of the IAU symposium No. 105 held in Geneva, Switzerland, September, 12-16, 1983. Maeder, A. (Geneva Observatory, Sauverny (Switzerland)); Renzini, A. (Bologna Univ. (Italy)) (eds.). Dordrecht, Netherlands; D. Reidel (1984). (CONF-8309172—).

From IAU symposium on observational tests of stellar evolution theory; Geneva, Switzerland (12 Sep 1983).

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The authors hypothesize that the redward evolution of post main sequence stars might be due to an increase in radiation pressure somewhere in the star that causes the layers above it to be pushed outward, resulting in an expanded envelope and a cooler surface temperature. If the radiative luminosity somewhere in the star approached the Eddington limit, the outer layers would obviously expand. However, due to the presence of gas pressure, the critical value for expansion would be somewhat less than the Eddington limit.

6402 Atmospheric Physics

REFER ALSO TO CITATION(S) 40115, 40989

40428 **(AD-A—152320/8/XAB) IMS (International Magnetospheric Study) contributions to the understanding of auroral precipitation, transport, and particle sources.** Fennell, J.F. (Aerospace Corp., El Segundo, CA (USA). Space Sciences Lab.). 1 Mar 1985. 44p. (TR—0084A(5940-05)-2). NTIS, PC A03/MF A01.

The progress in our understanding of plasma processes throughout the magnetosphere has increased dramatically during the International Magnetospheric Study (IMS) period. In this report the auroral ionosphere as a source of particles for the magnetosphere and the auroral particle acceleration and precipitation are emphasized. Some of the processes involved in the transport of particles from the ionosphere out into the magnetosphere are treated as well as the precipitation of magnetospheric particles into the auroral and subauroral ionosphere. Some of the effects auroral ionospheric ions have on the magnetospheric plasma composition are described. A brief overview of pre-IMS results is also given to set the stage for a description of IMS contributions in these areas.

40429 **(AD-A—152714/2/XAB) Boundary layers as the primary transport regions of the earth's magnetotail. Scientific report 1977-1979.** Eastman, T.E.; Frank, L.A.; Huang, C.Y. (Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy). Feb 1985. 61p. NTIS, PC A04/MF A01.

A comprehensive survey of ISEE and IMP LEPEDEA plasma measurements in the earth's magnetotail reveals that the magnetotail reveals that the magnetospheric boundary layer and the plasma sheet boundary layer are the primary transport regions there. These plasma measurements also reveal various components of the plasma sheet, including the central plasma sheet and plasma sheet boundary layer. A significant new result reported is that of cold- and hot-plasma components that are spatially co-present within the central plasma sheet. Such plasma components cannot be explained merely by temporal variations in spectra involving the entire plasma sheet. Contributions to a low-temperature component of the plasma sheet enter directly from the boundary layer located along the magnetotail flanks. Field-aligned flows predominate within the plasma sheet boundary layer which is almost always present and is located near the high- and low-latitude border of the plasma sheet. The plasma sheet boundary layer comprises highly anisotropic ion distributions, including counter-streaming ion beams, that evolve into the hot, isotropic component of the plasma sheet. Tailward acceleration regions generate these ion beams with plasma input from the magnetospheric boundary layer. Antisunward-flowing ion beams, at $E/q < 1$ kV and of ionospheric composition, are frequently observed in the plasma sheet boundary layer and in tail lobes. These ion beams are likely accelerated at low altitude over the polar cap and especially along auroral field lines.

40430 (LA-UR—85-2092) Magnetic reconnection in the terrestrial magnetosphere. Feldman, W.C. (Los Alamos National Lab., NM (USA)). 1984. Contract W-7405-ENG-36. 14p. (CONF-8408121—5). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014107.

From American Institute of Physics conference; Taos, NM, USA (6 Aug 1984).

An overview is given of quantitative comparisons between measured phenomena in the terrestrial magnetosphere thought to be associated with magnetic reconnection, and related theoretical predictions based on Petschek's simple model. Although such a comparison cannot be comprehensive because of the extended nature of the process and the relatively few in situ multipoint measurements made to date, the agreement is impressive where comparisons have been possible. This result leaves little doubt that magnetic reconnection does indeed occur in the terrestrial magnetosphere. The maximum reconnection rate, expressed in terms of the inflow Mach number, M/sub A/, is measured to be M/sub A/ = 0.2 +- 0.1.

40431 North-south and dawn-dusk plasma asymmetries in the distant tail lobes: ISEE 3. Gosling, J.T.; Baker, D.N.; Bame, S.J.; Feldman, W.C.; Zwickl, R.D.; Smith, E.J. (University of California, Los Alamos National Laboratory, Los Alamos, New Mexico). *Journal of Geophysical Research;* **90**: No. A7, 6354-6360(1 Jul 1985).

ISEE 3 plasma measurements made in the distant geomagnetic tail during rapid traverals of the current sheet from one lobe to the other show that the lobe densities on opposite sides of the current sheet often differ by a factor of ~3-10 or more. On the dawnside of the tail the north lobe plasma has the higher density when the interplanetary magnetic field (IMF) has a +B/sub y/ component, and the south lobe plasma has the higher density when the IMF has a -B/sub y/ component. The sense of this asymmetry is reversed on the duskside of the tail. Such IMF-controlled asymmetries in lobe plasma density are consistent with earlier observations made much closer to earth and can be interpreted most simply as a consequence of an "open" geomagnetic tail.

40432 Magnetospheric impulse response for many levels of geomagnetic activity. Bargatze, L.F.; Baker, D.N.; McPherron, R.L.; Hones E.W. Jr. (University of California, Los Alamos National Laboratory, New Mexico). *Journal of Geophysical Research;* **90**: No. A7, 6387-6394(1 Jul 1985).

The temporal relationship between the solar wind and magnetospheric activity has been studied using 34 intervals of high time resolution IMP 8 solar wind data and the corresponding AL auroral activity index. The median value of the AL index for each interval were utilized to rank the intervals according to geomagnetic activity level. The linear prediction filtering technique was then applied to model magnetospheric response as measured by the AL index to the solar wind input function VB/sub s/. The linear prediction filtering routine produces a filter of time-lagged response coefficients which estimates the most general linear relationship between the chosen input and output parameters of the magnetospheric system. It is found that the filters are composed of two response pulses speaking at time lags of 20 and 60 min. The amplitude of the 60-min pulse is the larger for moderate activity levels, while the 20-min pulse is the larger for strong activity levels. A possible interpretation is that the 20-min pulse represents magnetospheric activity driven directly by solar wind coupling and that the 60-min pulse represents magnetospheric activity driven by the relase of energy previously stored in the magnetotal. If this interpretation is correct, the linear filtering results suggest that both the driven and the unloading models of magnetospheric response are important facets of a more comprehensive response model.

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REFER ALSO TO CITATION(S) 39481, 39605, 40498, 40856, 40929

40433 (AD-A—152760/5/XAB) Examination of the use of wave packets for the calculation of atom diffraction by surface. Annual technical report. Jackson, B.; Metiu, H. (California Univ., Santa Barbara (USA). Dept. of Chemistry). Mar 1985. 41p. (TR—14). NTIS, PC A03/MF A01.

The authors use analytic models valid for neutron scattering and numerical calculations to examine a method proposed by Drolshagen and Heller for computing atom diffraction from surfaces. The main concern is the manner in which the use of narrow packets, causing a partial coherence of the incident beam, might affect the diffracted intensity. We find that the demands of representing beam coherence correctly conflict with the requirements for the validity of the propagation scheme. Some improvements are suggested that should increase the reliability of the method without affecting greatly its remarkable computational and conceptual advantages.

40434 (AD-A—152762/1/XAB) Temperature dependence of diffracted-beam intensities in atom-surface scattering. Annual technical report. Jackson, B.; Metiu, H. (California Univ., Santa Barbara (USA). Dept. of Chemistry). Mar 1985. 35p. (TR—16). NTIS, PC A03/MF A01.

We develop a new method for the calculation of the atom scattering analog of the Debye-Waller factor. Unlike x-ray and neutron scattering, the properties of an atom scattered by a solid surface cannot be computer by perturbation theory, therefore the simple Debye-Waller theory cannot be applied. Nevertheless the Debye-Waller phenomenon has a close analog: the elastic intensity is depressed due to the uncorrelated part of the thermal motion of the lattice atoms. To compute this effect we develop a time dependent scattering theory in which the quantum properties of the scattered atom are described by propagating coherently an ensemble of wave packets and lattice motion is simulated by a classical Langevin equation. Applications are made to He and Ne scattering from a surface whose lattice dynamics mimics that of Pt(111) but whose corrugation was slightly increased to enrich the diffraction structure.

40435 (AD-A—152879/3/XAB) Study of excitations during collisionally-induced electron detachment of negative ions. Annual report, 1 August 1983-31 July 1984. Menendez, M.G.; Duncan, M.M. (Georgia Univ., Athens (USA). Dept. of Physics and Astronomy). 31 Jul 1984. 23p. NTIS, PC A02/MF A01.

Measurements of the double differential cross sections for the electron detachment of the negative ion of hydrogen upon collision with atomic targets were made around 1 MeV. The double differential cross section at and near zero degrees in the laboratory frame for the single electron detachment was found to account for all of the structure seen in the total (non-specific) double differential cross section. Although quantitative data do not yet exist, it is clear that the double electron detachment process does not contribute significantly to the total double differential cross section at zero degrees. Hence, the non-specific cross sections were used to investigate details of the angular, incident energy, and target dependencies of the structure. The results strongly indicate that a portion of the structure is a manifestation of leaving the final state projectile, the hydrogen atom, in an excited state. A modified version of the electron energy analyzer which permits measurement of Lyman-alpha photons coincident with ejected electrons was completed. This version of the analyzer will be used to measure directly the electron energy spectrum coincident with excitation of the hydrogen atom to the 2p state.

40436 (AERE-M—3396) Molecular orbitals for charge exchange. Greenland, P.T. (UKAEA Atomic Energy Research Establishment, Harwell. Theoretical Physics Div.). Apr 1984. 65p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701703.

This report describes some details of the ATMOL suite of programs, as they are presently implemented at Harwell. As an example the calculation of the C^{4+} + H correlation diagram is described.

40437 (AERE-R—11281) Low energy charge capture cross sections. Greenland, P.T. (UKAEA Atomic Energy Research Establishment, Harwell. Theoretical Physics Div.). Apr 1984. 66p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701704.

Final report.

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This report surveys the available data on charge capture from atomic H by partially and completely stripped light ions, and partially stripped heavy ions. The energy range is nominally between 3 and 200 eV, although the scarcity of data for many species has meant that these limits are not always observed. Analytical fits to the available data are given. General theoretical considerations are discussed, and some results on the molecular potential energy diagrams and low energy capture for the C^{4+} + H and Ni^{3+} + H systems are given.

40438 **(CONF-850605—1) Multiphoton ionization of NO-rare gas van der Waals species.** Miller, J.C. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 3p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014650.

From 7. international conference on laser spectroscopy; Maui, HI, USA (24 Jun 1985).

To date, most spectroscopic studies of electronic states of clusters involving small molecules and rare gas (RG) atoms have employed laser-induced fluorescence techniques. Consequently, such studies (e.g., Levy and co-workers on I_2-RG species have been limited to the lowest lying electronic states, which are usually velance in character. Furthermore, the identification of the cluster often must be inferred from spectral shifts, pressure dependence, etc. We have applied the technique of multiphoton ionization (MPI) to the study of electronic spectroscopy of NO-RG van der Waals species and extended the previous experiments of SATO et al. These works show several of the advantages of the MPI technique relative to the LIF method. Specifically, mass analysis can provide identification of the new species formed as well as allowing discrimination against other species (the parent monomer or higher clusters) while recording spectra. Furthermore, the use of MPI photoelectron spectroscopy can provide data on the states of the cluster ion as well.

40439 **(CONF-8506150—1) New beam neutralization concept: laser photodetachment in a magnetic field.** Crawford, O.H.; Krause, H.F. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 21p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014655.

From Neutralizer workshop; Upton, NY, USA (5 Jun 1985).

The major advantage of laser photodetachment as a method for neutralizing a negative ion beam is that the emittance increase can be made as small as desired. (This is especially important for production of a high-brightness beam.) Since the momentum of the photon is negligible, it is only the recoil from the leaving electron that causes any beam spread in photodetachment. The closer the laser is turned to the threshold frequency, the smaller the relative energy of the electron and atom, and the smaller the recoil. The problem with photodetachment is the high laser power requirement. The cross section approaches zero as the laser frequency approaches the detachment threshold. As a consequence, for a high-brightness application it is estimated that the laser power required would exceed the anticipated beam power. We show that the imposition of a solenoidal magnetic field in the neutralization region may make photodetachment practical, by enhancing the cross section.

40440 **(CTA-IEAV-NT—04/84) Electron-repulsion integral and the helium atom: the integral transform approach.** Ornellas, F.R. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Estudos Avancados). Mar 1984. 4p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701691.

It is shown that the electron-repulsion integral, found when helium atom problem is treated, can be solved by the Fourier transform method.

40441 **(CTA-IEAV-NT—028/83) Study of an electron gun for metal evaporation.** Silva, R. da. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Estudos Avancados). 1983. 18p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701708.

In order to design a eletron gun with a long strip beam, an analysis was done using electrostatic lenses. Due the effects of space charge, it was indicated a beam with low current and high energy.

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40442 **(DOE/ER/06027—15) [X-ray charge-changed beam experiments at TUNL]. Progress report.** Shafroth, S.M. (North Carolina Univ., Chapel Hill (USA)). 1985. Contract AS05-78ER06027. 52p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85015282.

Topics covered include experiments at TUNL which use the x-ray charge-changed-beam apparatus, nonresonant transfer and excitation, other x-ray charge changed beam experiments, simultaneous excitation and ionization, vacancy sharing, bare He^{+}-like and He-like beam experiments, single and double electron capture, and radiative electron capture. (GHT)

40443 **(DOE/OR/00033—T105) Determination of optical properties by third-harmonic generation in noble gases in unfocused laser beams.** Ferrell, W.R. (Oak Ridge Associated Universities, Inc., TN (USA)). Mar 1985. Contract AC05-76OR00033. 120p. NTIS, PC A06/MF A01; GPO Dep. File Number DE85015016.

Thesis. Submitted to Univ. of Tennessee, Knoxville.

A new laser technique involving phase-matched third-harmonic generation in unfocused laser beams has been used to determine vacuum ultraviolet (VUV) oscillator strengths in xenon, VUV indices of refraction for the buffer gas (krypton or argon), and the VUV absorption coefficients were determined through total ionization measurements in the frequency regions of phase matching resulting from the interaction of unfocused linearly polarized light with mixtures of xenon and positively dispersive buffer gases. Since the multiphoton ionization mechanism is sharply dominated by the dimer absorption of third-harmonic photons, the ionization signal provides an excellent probe for determination of these optical parameters. Absolute ionization measurements were made through use of a proportional counter which was calibrated by the ionization resulting from an internal ^{55}Fe source. 38 refs., 33 figs., 3 tabs.

40444 **(GSI—85-15-Prepr.) Anomalous positron peaks from supercritical collision systems.** Cowan, T.; Backe, H.; Begemann, M.; Bethge, K.; Bokemeyer, H.; Folger, H.; Greenberg, J.S.; Grein, H.; Gruppe, A.; Kido, Y. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). Mar 1985. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85752020.

Narrow positron peaks are observed in five supercritical collision systems with combined nuclear charge 180 <= Zsub(u) <= 188. The peaks do not originate from nuclear internal pair conversion and their production appears to occur in a narrow projectile energy interval near the Coulomb barrier. The lineshapes are consistent with emission by a source moving with the CM velocity. Particularly notable is an apparent independence of the peak energies on Zsub(u). These observations are discussed in the context of the spontaneous decay of the QED vacuum and other new potential sources of line positron spectra.

40445 **(INIS-mf—9314) Measurement of the hyperfine structure of the ground state of muonic helium(3).** Arnold, K.P. (Heidelberg Univ. (Germany, F.R.). Naturwissenschaftlich-Mathematische Gesamtfakultaet). 1984. 81p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE85781262.

Diss. (Dr.rer.nat.).

Polarization measurements by the muon spin rotation method yielded the detection that in the formation of $^{3}He\mu^{-}e^{-}$ the hfs states are occupied differently. In pure helium(3) a residual polarization of 2.6(4)% of the $(^{3}He\mu^{-})^{+}$ ion was found. At an admixture of 2% xenon the neutral $^{3}He\mu^{-}e^{-}$ atom is formed with a polarization of 1.8(4)%. The hfs measurements were performed by means of the high-frequency spectroscopy. By inducing of Δm/sub F/ = +-1 transitions the muon polarization is changed. This effects a change of the asymmetric electron distribution which arises by the parity-violating muon decay and can be detected by plastic scintillators. The measurements were performed at a highly pure gas target of 19.90 bar helium(3) to which 1.6% Xe were admixed, at 20°C and in a magnetic zero field. The pressure shift for the hfs measurements of $^{3}He\mu^{-}e^{-}$, extrapolated to the buffer gas pressure zero, is: Δν/sub hfs/ = 4166.41(5) MHz. (orig./HSI).

40446 **(INIS-mf—9568) Electrons with continuous energy distribution from energetic heavy ion collisions.** Berenyi, D. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). 1984. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781263.

The properties and origin of continuous electron spectrum emitted in high energy heavy ion collisions are reviewed. The basic processes causing the characteristic regions of the continuous spectrum are described. The contribution of electrons ejected from the target and from the projectile are investigated in detail in the cases of light and heavy projectiles. The recently recognized mechanisms, electron-capture-to-continuum (ECC) and electron-loss-to-continuum (ELC), leading to a cusp in forward direction, and their theoretical interpretations are discussed. The importance of data from ion-atom collisions in the field of atomic physics and in applications are briefly summarized. 64 references, 13 figures.(D.Gy).

40447 **(INIS-mf—9569) Cusp studies for simple collision systems.** Berenyi, D.; Gulyas, L.; Koever, A.; Szmola, E.; Szabo, Gy.; Burkhard, M.; Groeneveld, K.O. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). 1984. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781264.

Cusp-shaped peaks discovered in the electron spectrum in forward direction from ion-atom collisions at an energy at which the corresponding velocity of electron is equal to the projectile velocity are investigated. Important features (position, shape, half width and its energy dependence) of cusps are studied in the cases of He^{+}, He^{++} - He simple collision systems in the energy range of 0.8-2.4 MeV. The electron energy is analyzed by a special double-pass electrostatic electron spectrometer (ESA-13) with angular acceptance of 1° and energy resolution of 0.3%. Experimental results are compared with theoretical calculations of PWBA method. 7 references, 4 figures. (D.Gy.).

40448 (INIS-mf—9646, pp 64-65) **Collision cascades in silicon and germanium.** Howe, L.M.; Rainville, M.H. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781447. (CONF-8305262—Summ.).

From 10. annual meeting of the Microscopical Society of Canada; Chalk River, Ontario, Canada (17 May 1983).

Summary.

40449 **(INIS-mf—9694) Intensive beam dosimetry of accelerated electrons of low energy.** Oproiu, C. (Institutul de Fizica si Inginerie Nucleara, Bucharest (Romania)). 1984. 25p. (In Romanian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701743.

Summary of a doctorate thesis.

Dosimetric control of electron beams ranging between 0.3 MeV and 10 MeV is treated using proper dosimetric methods relying on calorimetry, Tricke chemical solution, dosimetric film of cellulose triacetate. Proper methods are pointed out for measurements in inhomogeneous fields, bringing into evidence the results obtained in deep dose distributions and on the surface of irradiated material. A measuring method of dose distribution in depth by means of an assembly with calorimetric elements, as well as a practical method to pointing out dose distribution and equidose curves along the depth of irradiated electric cable depth are presented. In order to find out the main sizes of accelerated electron beam one uses proper devices relying on Faraday cylinder, total absorption calorimeter, ionization chambers.

40450 **(INIS-mf—9706) Crystal field and magnetocrystalline anisotropy in various crystalline systems.** Adam, S.A. (Institutul de Fizica si Inginerie Nucleara, Bucharest (Romania)). 1983. 21p. (In Romanian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701747.

Summary of a doctorate thesis.

Systematic derivation of the one-perticle crystal field Hamiltonians is given for all possible site symmetries in crystals. Distinct parametrizations are found to occur for the eleven Laue-symmetry groups. The functional dependence of the Hamiltonian on the choice of the coordinate axes is also investigated. A general method is developed for the derivation of the one-particle crYstal field potential characteristic of a given crystallographic symmetry, for arbitrary effective interatomic forces. Calculations performed for cubic and hexagonal structures lead to the standard representations in spherical harmonics with the coefficients given, however, by power series of rsup(n) rather than by single rsup(n) terms as obtained within the usual hypothesis of Coulombian interatomic forces. This result has implications on the interpretation of some theoretical and experimental data. Theoretical results are obtained for the crystal field coefficients which enable us to develop an approach to the use of the crystal field data for the derivation of information on the effective interatomic forces in crystals. The method is applied to the magnetic Sm^{3+} ion in $SmCo_5$, and it is shown to provide valuable results both for the effective interatomic potential and for the consistency of various sets of crystal field parameters previously proposed in the literature. Maqnetocrystalline anisotropy of the rare-earth intermetallic compounds are discussed. Single-ion anisotropy model is used for $SmCo_5$ and the theoreticalpr predictions are compared with the experimental data.

40451 (INIS-SU—282, pp 568) **Observation of positronium in semiconductors irradiated by laser.** Pogrebnyak, A.D.; Surov, Yu.P. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40452 **(JAERI-M—84-049) Data on ionization, excitation, dissociation and dissociative ionization of targets by helium ion bombardments, (1). Target ionization, excitation, dissociation and dissociative ionization induced by several keV to 3.5 MeV helium ions incident on thin gas targets.** Oda, Nobuo; Urakawa, Junji. (Japan Atomic Energy Research Inst., Tokyo). Mar 1984. 78p. NTIS (US Sales Only), PC A05/MF A01. File Number DE85701741.

This report presents a compilation of the experimental data on cross sections for the ionization, excitation, dissociation and dissociative ionization processes of targets in helium ion impacts on atoms and molecules under a single collision condition. These measurements were carried out in the energy range from several keV to 3.5 MeV. A systematic survey has been made on the literatures from 1975 to the end of 1982. A list of references is also given, including relevant papers published before 1975.

40453 **(JAERI-M—84-069) Data on collisions of helium atoms and ions with atoms and molecules. (2). Cross sections for charge transfer of He^{2+}, He^{+}, He and He^{-} with He, Ne, Ar, Kr and Xe.** Nakai, Yohta; Shirai, Toshizo; Sataka, Masao; Kikuchi, Akira. (Japan Atomic Energy Research Inst., Tokyo). Apr 1984. 138p. NTIS (US Sales Only), PC A07/MF A01. File Number DE85701742.

This report presents a compilation of the experimental data on cross sections for charge transfer of He^{2+}, He^{+}, He and He^{-} with inert gases such as He, Ne, Ar, Kr and Xe. A survey has been made systematically of the literatures up to the end of 1983. The cross sections are given as a function of projectile energy in graphs and tables, and a list of references is also attached.

40454 (JINR—D-7-83-644, pp 489-508) **Investigations in atomic physics by heavy ion projectiles.** Berenyi, D. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Investigations in atomic physics by high-energy heavy ions are discussed. The main attention is paid to collision mechanisms (direct Coulomb interaction, quasi-molecular collision mechanism and other models) and the structure of highly ionized and excited atoms. Some problems of fundamental issues (Lamb shift of H-like heavy ions, the superheavy quasi-atoms and the position production in supercritical fields) are conside-- red in detail.

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40455 (JINR—D-7-83-644, pp 509-517) **Study on a neon Auger spectrum in ion-atom collisions with neon and argon ions at E=5.6 MeV/nucleon 230.** Varga, D.; Veg, Ya.; Kadar, I.; Rits, Sh.; Shulik, B.; Shchegolev, V.A.; Bereni, D. (Joint Inst. for Nuclear Research, Dubna, USSR). 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

K-Auger spectrum of neon in ion-atom collisions with Ne^{+9}, Ne^{+10}, Ar^{+16} and Ar^{+17} ions with the energy E=5.6 MeV/nucleon is investigated. The growth of ion charge brings about a considerable decrease in intensity of lines corresponding to transitions after single ionization of K shell of the ion. The intensity of satellite lines proving multiple ionization of L shell simultaneously rises. The data obtained on the average number of knocked-out electrons prove the linear charge dependence for Ne^{+9}, Ar^{+16} and Ar^{+17}, ions, but ^{+10}Ne ion gives elevated values which is explained to some extent by higher possibility of electron capture for stripped ions.

40456 (JINR—E-14-83-605) **Electric field gradients at Gd in gadolinium and rare earth trifluoride single crystals.** Budzynski, M.; Goremychkin, E.A.; Latuszynski, A.; Muehle, E.; Kochetov, O.I.; Muminov, A.I.; Mikolajchak, P.; Subotovicz, M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1983. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701748.

Electric field gradients at the Gd nuclei in monocrystals of gadolinium and rare earth trifluopides LaF_3, CeF_3, PtF_3, NdF_3, SmF_3, E uF_3, and CdF_3 have been measured by the method of integral perturbed angular correlation. The experimental data have been compared with those of point charge model calculations and with the results of other experiments such as Moessbauer spectroscopy, electron paramagnetic resonance, nuclear trifluorides of the light rare earth elements allow one to conlude that the field gradients cannot be explained within the point charge model. 41 references, 1 figure, 2 tables.

40457 (JINR—R-2-84-383) **Relativistic covariant single-time equation for ($\pi\mu$) atom.** Dvoeglazov, V.V.; Skachkov, N.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701739.

A relativistic three-dimensional quasipotential equation is considered, which describes the bound state of a scalar particle (e.g., the pion) and a fermion (muon). The spin structure of the interaction quasipotential in such a system is studied, and the corresponding partial expansion is obtained. 11 references.

40458 (LA—10439-MS) **New equations of state for Eu, Gd, and Ho.** Johnson, J.D.; Lyon, S.P. (Los Alamos National Lab., NM (USA)). May 1985. Contract W-7405-ENG-36. 6p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015354.

We have created with the GRIZZLY code new EOS's for Eu, Gd, and Ho. They are on the SESAME Library as material numbers 2110, 3280, and 3660, respectively. 3 refs., 3 figs.

40459 (LA-UR—85-2093) **Computation of low density, supersonic flow over a pitot tube.** Cline, M.C.; Hyde, J.C.; Gentry, R.A. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 8p. (CONF-850607—5). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014105.

From AIAA thermophysics conference; Williamsburg, VA, USA (18 Jun 1985).

The internal and external flow of N_2 gas over a pitot tube in the transitional regime between continuum and free-molecular flow is computed using the Navier-Stokes equations. Both slip and no-slip boundary conditions, as well as two different Reynolds numbers, are considered. These numerical solutions illustrate many interesting features of flow in this regime and, in general, are in reasonably good agreement with experiment.

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40460 (LA-UR—85-2106) **Muon spin relaxation study of exchange coupling in dilute AgMn alloys.** Heffner, R.H.; Cooke, D.W.; Hutson, R.L.; Schillaci, M.E.; Dodds, S.A.; Gist, G.A.; MacLaughlin, D.E. (Los Alamos National Lab., NM (USA); California Univ., Riverside (USA); Rice Univ., Houston, TX (USA)). 1985. Contract W-7405-ENG-36. 9p. (CONF-850890—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014104.

From International conference on magnetism; San Francisco, CA, USA (26 Aug 1985).

We have observed for the first time conduction-electron mediated muon-impurity coupling, and deduced the strength of the conduction electron-Mn exchange coupling. Our results are marginally consistent with a wave-vector dependent exchange model. 16 refs.

40461 (OUP—83-02) **Energy level shifts in atoms near a metallic plane.** Luetken, C.A.; Ravndal, F. (Oslo Univ. (Norway). Fysisk Inst.). Jan 1983. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701702.

The vacuum fluctuations of the electric field will shift the energy levels of an atom near a neutral conducting plate. These shifts in Rydberg atoms are calculated. The resuls of Casimir and Polder are recovered in the limit where on ignores any permanent dipole moment in the atom. Numerical values for the shifts of the lowest levels are given.

40462 (OUP—84-08) **Introduction to the microscopic theory of giant resonances.** Kuo, T.T.S. (Oslo Univ. (Norway). Fysisk Inst.). Mar 1984. 74p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701705.

The phenomenology of electric multipole giant resoncances (GR) in atomic nuclei is briefly reviewed and discussed in terms of collective variables. Then, the microscopic description of GR is discussed in terms of the Tamm-Dancoff approximation (TDA) and the random-phase approximation (RPA). The TDA and RPA equations are derived by linearization of the equation of motion. The necessary second quantization formalism is briefly summarized. The physical meaning of the TDA and RPA descriptions of GR is illustrated in a simple schematic model. Realistic TDA and RPA calculations of electric dipole and quadrupole GR in light nuclei are reviewed.

40463 (PUC-TN—17/82) **Graphical analysis for Rutherford backscattering spectra.** Barros Leite, C.V. de; Baptista, G.B.; Montenegro, E.C.; Paschoa, A.S. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1982. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701706.

A graphical method was developed to relate data from Rutherford Backscattering Spectrometry to sample characteristics, such as thickness and concentration profiles. The method was then applied to analyze characteristics of a gold film.

40464 (PUC-TN—23/82) **Quantum theory of laser radiation scattering by electrons in magnetic fields.** Rochlin, H.; Davidovich, L. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1982. 42p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701707.

A system consisting of an electron in a static magnetic field, interacting with the quantized electromagnetic field, within the non-relativistic and electric dipole approximations (with a cutoff in momentum space) is considered. The Heisenberg equations of motion are solved exactly and the time evolution of the electric field is determined. The power spectrum of the scattered radiation is calculated, when the electromagnetic field is initially in a coherent state. The results for the line shape of the scattered radiation are shown to be valid for magnetic fields up to 10^{13}G. The quantization of the electromagnetic field allows one to consider effects of the natural linewidth and its dependence on the magnetic field. The renormalization of the electron mass is included in these treatment, and the results remain finite when the cutoff goes to infinity.

40465 **(UCRL—92231) Positron annihilation and pressure-induced electronic s-d transition.** McMahan, A.K.; Skriver, H.L. (Lawrence Livermore National Lab., CA (USA); Risoe National Lab., Roskilde (Denmark)). Jun 1985. Contract W-7405-ENG-48. 7p. (CONF-850736—16). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014556.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

The polycrystalline, partial annihilation rates for positrons in compressed cesium have been calculated using the linear muffin-tin orbitals method. These results suggest that the pressure-induced electronic s-d transition in Cs should be directly observable by momentum sensitive positron annihilation experiments.

40466 **Optimum extracted negative-ion current densities from tandem high-density systems.** Hiskes, J.R.; Karo, A.M.; Willmann, P.A. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). *Journal of Applied Physics;* **58**: No. 5, 1759-1764(1 Sep 1985). Contract W-7405-ENG-48.

A tandem high-density hydrogen negative-ion-source system is optimized for the purpose of identifying the maximum possible extracted ion current densities. In the first chamber, vibrational excitation occurs by high-energy electron excitation (E-V process); in the second chamber negative ions are formed by dissociative attachment. The electron, atom, and molecular densities are varied together with the length of the second chamber. Electron excitation cross sections to the B^{1}summation/sub u/ and C^{1}product/sub u/ states are calculated as a function of vibrational excitation. The vibrational excitation approaches an asymptotic value as the first-chamber electron density increases. For a system with scale length R = 10 cm the optimum extracted current densities occur for gas densities near 10^{15} mol cm^{-3} for first-chamber electron densities equal to 10^{13} cm^{-3}, and for second-chamber electron densities in the 4—6 x 10^{12} cm^{-3} range. For atomic densities equal to one-tenth the molecular density and for second-chamber scale lengths as short as Z/R = 0.2, extracted current densities are approximately 30 mA cm^{-2}. As Z/R decreases toward 0.1, the current density is doubled. If the atomic density is increased to one-fifth the molecular density, these current densities are halved; for atomic densities equal to the molecular density, these current densities are reduced by a factor of 6. Applying the system scaling law and varying R from 10 cm toward 1 cm, the extracted current densities tend toward several hundred mA cm^{-2}.

40467 **Electronic states of CuO.** Madhavan, P.V.; Newton, M.D. (Chemistry Department, Brookhaven National Laboratory, Upton, New York 11973). *Journal of Chemical Physics;* **83**: No. 5, 2337-2347(1 Sep 1985).

Ab initio SCF and CI calculations are reported for the ground state and low-lying excited electronic states of CuO (i.e., within ~20 x 10^3 cm^{-1} of the X ^{2}Pi ground state), employing an ab initio effective potential for the Cu atomic core (1s—3p), and including comparisons of several atomic orbital basis sets. The calculated bond lengths, energy separation, and population analyses for the lowest two electronic states, X ^{2}Pi and Y $^2\Sigma^+$ [corresponding roughly to Cu^+ ($3d^{10}$) and O^- ($2p^5$), where the 2p oxygen hole is, repectively, $2p\pi$ and $2p\sigma$], do not vary appreciably among the basis sets tested (minimal and split valence bases on Cu, and a split valence basis on oxygen, with and without d-polarization functions and diffuse p functions on oxygen) and are in reasonable agreement with previous experimental and theoretical estimates. Most of the remaining excited states of CuO below ~20 x 10^3 cm^{-1} may be rationalized in terms of atomic-like excitations originating from the

40468 **Product state distributions for inelastic and reactive H+D$_2$ collisions as functions of collision energy.** Blais, N.C.; Truhlar, D.G. (Chemistry Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **83**: No. 5, 2201-2206(1 Sep 1985).

We have calculated state-to-state reaction cross sections for two new energies and state-to-state vibrationally inelastic cross sections for four energies for H+D$_2$ collisions on the most accurate available potential energy surface. The dynamics calculations are based on the quasiclassical trajectory quadratic smooth sampling method. We present a detailed analysis of the theoretical inelastic and reaction cross sections and compare the trends in the reactive scattering results to those calculated from Gerrity and Valentini's experiments and extrapolations thereof. The agreement between theory and experiment for the reactive scattering at 0.98—1.3 eV relative translational energy is stupendously good.

40469 **Dynamics of inelastic H+D$_2$ collisions: Product quantum state distributions at 1.1 and 1.3 eV collision energy.** Gerrity, D.P.; Valentini, J.J. (Chemistry Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545 and Department of Chemistry, Carroll College, Waukesha, Wisconsin 53186). *Journal of Chemical Physics;* **83**: No. 5, 2207-2213(1 Sep 1985).

We have measured the quantum state distributions of rotationally and vibrationally excited D$_2$ formed in inelastic H+D$_2$ collisions at 1.1 and 1.3 eV, under effectively single-collision conditions. The distributions are derived from highly time-resolved CARS spectra of D$_2$. The hydrogen atoms are generated by laser photolysis of HI in an HI/D$_2$ gas mixture. The D$_2$ produced in these inelastic collisions is less rotationally and vibrationally excited than the HD produced in reactive H+D$_2$ collisions at the same energies. The results also show that at 1.3 eV the H+D$_2$ cross section for producing vibrationally excited D$_2$ is about one-half the cross section for producing vibrationally excited HD. The measured D$_2$ quantum state distributions are in excellent agreement with distributions derived from quasiclassical trajectory calculations on an 'iab initio H$_3$ potential surface. However, the quasiclassical trajectory calculated ratio of the vibrationally inelastic nonreactive cross section to the vibrationally nonadiabatic reactive cross section is about 1.5.

40470 **High current ion source.** Brown, I.G.; Gavin, J.E.; MacGill, R.A. (University of California, Lawrence Berkeley Laboratory, Berkeley, California 94720). *Applied Physics Letters;* **47**: No. 4, 358-360(15 Aug 1985). Contract AC03-76SF00098.

We describe a new kind of ion source using a metal vapor vacuum arc as the plasma formation mechanism. The source is simple and reliable and can produce long pulse intense ion beams from any solid electrically conducting material. Using a range of materials from lithium to uranium we have extracted low divergence beams with ion current up to 1 A.

40471 **Molecular structures and energetics for the lowest triplet states of glyoxal.** Gaw, J.F.; Schaefer H.F. III. (Department of Chemistry and Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Chemical Physics;* **83**: No. 4, 1741-1745(15 Aug 1985).

The equilibrium geometries of the lowest three triplet states of trans glyoxal (HCOHCO) have been predicted at the self-consistent-field (SCF) level of theory using a double zeta plus polarization (DZ+P) basis set, designated C,O(9s5p1d/4s2p1d), H(4s1p/2s1p). Two of the molecular structures thus predicted differ radically from the known ^{1}A/sub g/ ground state equilibrium geometry. Specifically the $\pi \rightarrow \pi^*$ ^{3}B/sub u/ electronic state may be best described by the valence structure :[RW4::xO::].

40472 **Systematic study of molecular anions within the self-consistent-field approximation: OH^-, CN^-, C_2H^-, NH^-_2, and CH^-_3.** Lee, T.J.; Schaefer H.F. III. (Department of Chemistry and Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Chemical Physics;* **83**: No. 4, 1784-1794(15 Aug 1985).

The title molecular anions have been studied at the self-consistent-field (SCF) level of theory with several different basis sets. The smallest of these bases is triple zeta (TZ) in quality while the largest can be labeled near Hartree—Fock limit. The dependence of proton affinities, dipole moments, harmonic frequencies, and infrared intensities on the inclusion of diffuse functions in the basis set is investigated. It is concluded that at the SCF level of theory the addition of diffuse s and p functions (for first row elements) is necessary in order to obtain reliable results. This is true especially for NH^-_2 and CH^-_3. A method to extend any standard Gaussian basis

set is suggested. Finally, predictions are made for some of the as yet unobserved fundamentals of the anions.

40473 General factorization relations and consistency conditions in the sudden approximation via infinite matrix inversion. Chan, C.K.; Hoffman, D.K.; Evans, J.W. (Ames Laboratory and Department of Chemistry, Iowa State University, Ames, Iowa 50011). *Journal of Chemical Physics;* **83**: No. 4, 1637-1647(15 Aug 1985). Contract W-7405-ENG-82.

Local, i.e., multiplicative, operators satisfy well-known linear factorization relations wherein matrix elements (between states associated with a complete set of wave functions) can be obtained as a linear combination of those out of the ground state (the input data). Analytic derivation of factorization relations for general state input data results in singular integral expressions for the coefficients, which can, however, be regularized using consistency conditions between matrix elements out of a single (nonground) state. Similar results hold for suitable "symmetry class" averaged matrix elements where the symmetry class projection operators are "complete." In several cases where the wave functions or projection operators incorporate orthogonal polynomial dependence, we show that the ground state factorization relations have a simplified structure allowing an alternative derivation of the general factorization relations via an infinite matrix inversion procedure. This form is shown to have some advantages over previous versions. In addition, this matrix inversion procedure obtains all consistency conditions (which is not always the case from regularization of singular integrals).

40474 Two-photon spectroscopy of np and nf Rydberg states of atomic iodine. Pratt, S.T. (Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review [Section] A: General Physics;* **32**: No. 2, 928-936(Aug 1985).

The two-photon resonant, three-photon ionization spectrum of atomic iodine in the I(^{2}P/sub 1/2/ state is presented. The I(^{2}P/ sub 1/2/ state is produced by photodissociation of methyl iodide, and its two-photon excitation spectrum exhibits ($^3P_2$)np and ($^3P_2$)nf Rydberg series converging to the I^+ $^2P_2$ ground state. With use of this technique, the single-photon forbidden np and nf series are readily observed to $n>30$.

40475 Photoionization of the excited 3p state of sodium: Experiment and theory. Preses, J.M.; Burkhardt, C.E.; Corey, R.L.; Earsom, D.L.; Daulton, T.L.; Garver, W.P.; Leventhal, a.J.J.; Msezane, A.Z.; Manson, S.T. (Department of Chemistry, Brookhaven National Laboratory, Upton, New York 11973). *Physical Review [Section] A: General Physics;* **32**: No. 2, 1264-1266(Aug 1985).

Measurements of the cross section for photoionization of the excited 3p state of sodium have been made over a significant energy range. Calculations at the central-field and Hartree-Fock levels have also been carried out. Agreement between theory and experiment is excellent.

40476 Further generalization of Landau-Zener calculation. Carroll, C.E.; Hioe, F.T. (Department of Physics, St. John Fisher College, Rochester, New York 14618). *Journal of the Optical Society of America B: Optical Physics;* **2**: No. 8, 1355-1360(Aug 1985). Contract FG02-84ER13243.

A three-level model is used for an atom driven by laser beams of constant amplitude; their detunings are proportional to the time. Simple formulas for the resulting transition probabilities are derived analytically. Special cases of these results are the Landau-Zener result for a two-level model and our earlier result for a symmetrical three-level model.

40477 Transient delayed spectrum of collisionally damped resonance fluorescence in a partially coherent field. Huang, X.Y.; Cresser, J.D.; Eberly, J.H. (Department of Physics and Astronomy, University of Rochester, Rochester, New York 14627). *Journal of the Optical Society of America B: Optical Physics;* **2**: No. 8, 1361-1372(Aug 1985).

The time-dependent spectrum of the light scattered by a collisionally damped two-level atom weakly excited off resonance by a partially coherent laser field is evaluated. Both the collisional and the laser noise are treated as classical Markovian, Gaussian processes while, in addition, the atom is assumed to experience damping and fluctuations that are due to its coupling to an unspecified exterior reservoir. The scattered-field spectra are determined both at steady state and at times following the abrupt turn off of the laser field (the delayed spectrum). The distinct contributions to these spectra arising from the various noise sources as well as the finite bandwidth of the detecting interferometer are investigated in each case. Where appropriate, comparisons are made with related work of Saari [Light Scattering in Solids (Plenum; New York, 1979)]. A general inequality is also found that must be satisfied by the longitudinal and the transverse decay rates induced by the exterior reservoir. Finally, the inverse detuning of the laser is found to provide a limit on the time in which the undressing of the atom could be observed to occur following the turn off of the laser.

40478 Bound-free ultraviolet emission from triatomic hydrogen. Raksit, A.B.; Porter, R.F.; Garver, W.P.; Leventhal, J.J. (Department of Chemistry, Cornell University, Ithaca, New York 14853). *Physical Review Letters;* **55**: No. 4, 378-381(22 Jul 1985). Contract FG02-84ER13237.

We report the first observation of an ultraviolet emission continuum attributed to transitions originating in bound Rydberg states of H_3 and terminating on the repulsive ground state.

40479 New mechanism for resonant dtμ formation and epithermal effects in muon-catalyzed fusion. Cohen, J.S.; Leon, M. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review Letters;* **55**: No. 1, 52-55(1 Jul 1985).

A recent muon catalysis experiment with a low-density D-T target saw a pronounced transient in the appearance of fusion neutrons. We propose that this transient is due to resonant molecular formation at epithermal energies. This effect is calculated, including the contribution of direct (as opposed to dipole) mesomolecule formation. The direct process is the dominant one, but has not previously been considered. The results agree well with experiment.

40480 Measurement and analysis of the spectrum of neutral arsenic. Howard, L.H.; Andrew, K.L. (Department of Physics, Purdue University, West Lafayette, Indiana 47907). *Journal of the Optical Society of America B: Optical Physics;* **2**: No. 7, 1032-1077(Jul 1985).

The atomic-emission spectrum of neutral arsenic has been remeasured from 1644 A to 1.2 μm and extended to 3.6 μm. The light source was a microwave-excited electrodeless discharge tube. Instrumentation used included two Fourier spectrometers and a number of concave grating spectrographs. The number of emission lines was increased from the published 333 lines to 1478, 1295 of which are classified as transitions between 95 odd-parity levels and 96 even-parity levels. Of these 191 levels, 104 were the result of this experimental endeavor. Of the previously known 87, 13 were newly classified and 15 reclassified as a result of our analysis. At present, 175 of the 191 levels are classified. The classifications of these levels were accomplished with the help of ab initio calculations and least-squares fitting methods. Designations are given in both LS and JK representation when possible along with calculated compositions in both representations of the levels consisting of less than 75% of a dominant eigenvector component.

40481 Four-photon-resonant third-harmonic generation in Hg. Smith, A.V. (Sandia National Laboratories, Albuquerque, New Mexico 87115). *Optics Letters;* **10**: No. 7, 341-343(Jul 1985). Contract AC04-76DP00789.

A tunable resonant enhancement of third-harmonic and sum-frequency generation is observed at four-photon resonance with the 7^1S, 6^1D, and 6^3D levels and at five-photon resonance with 9^1P levels of atomic mercury. The causes of this resonant enhancement are examined and appear to include a nonlinear refractive index and nonlinear mixing of order 5 and higher. A perturbative treatment of the nonlinearities is found to be inadequate.

40482 Spin-rotation and hfs constants for the X^2u^+ and $B^2\Sigma^+$ states of CaI. Childs, W.J.; Goodman, G.L.; Goodman, L.S.; Pfeufer, V. (Argonne National Lab., IL). *Journal of Molecular Spectroscopy;* 107: 94-107(1984). Contract W-31-109-ENG-38.

The molecular-beam, laser-rf double-response technique is used to obtain precise values for the spin-rotation and hyperfine interaction constants in the $X^2\Sigma^+$ ground state of $^{40}Ca^{127}I$. The measured X-strate splitting information is supplemented by $B \rightleftharpoons X$ optical hfs splitting data to obtain hfs constants for the exicted $B^2\Sigma^+$ state. The results for both states are compared with previously reported values for CaI and other calcium monohalides. 21 references, 3 figures, 4 tables.

40483 Multiconfiguration Hartree-Fock calculations for complex atoms. Fischer, C.F. (Vanderbilt Univ., Nashville, TN). pp 29-56 of Progress in atomic spectroscopy, Part C. Beyer, H.J.; Kleinpoppen, H. (eds.). New York, NY; Plenum Publishing Corporation (1984).

The Hartree-Fock method has become a standard in atomic structure theory. Simpler methods are often compared with it when accessing their reliability or worth and the notion of correlation, which intuitively may be thought of as the correction needed to account for the fact that electrons do not move independently in a central field, is defined with respect to the Hartree-Fock method rather than some other independent-particle model. In fact, in an earlier article in this series, Fricke (Progress in Atomic Spectroscopy, Part A, Plenum Press (1978)), states, "The so-called HF method is the basis of all good atomic calculations." In some sense, the Hartree-Fock method is the best method. The author briefly reviews its properties here. 67 references, 2 figures.

40484 Electronic structure of molecules using relativistic effective core potentials. Hay, P.J. (Los Alamos National Lab., NM). pp 383-401 of Relativistic effects in atoms, molecules, and solids. Malli, G.E. (ed.). New York, NY; Plenum Publishing Corporation (1983).

In this review an approach is outlined for studying molecules containing heavy atoms with the use of relativistic effective core potentials (RECP's). These potentials play the dual roles of (1) replacing the chemically-inert core electrons and (2) incorporating the mass velocity and Darwin term into a one-electron effective potential. This reduces the problem to a valence-electron problem and avoids computation of additional matrix elements involving relativistic operators. The spin-orbit effects are subsequently included using the molecular orbitals derived from the RECP calculation as a basis.

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REFER ALSO TO CITATION(S) 40952, 40957, 40958

40485 (IFE/KR/E—84/008) Vacuum spark breakdown model based on exploding metal wire phenomena. Haaland, J. (Institute for Energy Technology, Kjeller (Norway)). Jun 1984. 29p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781038.

Spark source mass spectra (SSMS) indicates that ions are extracted from an expanding and decaying plasma. The intensity distribution shows no dependance on vaporization properties of individual elements which indicates explosive vapour formation. This seems further to be a requirement for bridging a vacuum gap. A model including plasma ejection from a superheated anode spot by a process similar to that of an exploding metal wire is proposed. The appearance of hot plasma points in low inductance vacuum sparks can then be explained as exploding micro particles ejected from a final central anode spot. The phenomenological model is compared with available experimental results from literature, but no extensive quantification is attempted.

40486 (LA—10187-MS) Turbulence in two-field incompressible flow. Besnard, D.; Harlow, F.H. (Los Alamos National Lab., NM (USA)). May 1985. Contract W-7405-ENG-36. 113p. NTIS, PC A06/MF A01; GPO Dep. File Number DE85015361.

We derive in this report a model for two-field turbulence. This model gives most of the required features, such as mass diffusion, damping of the turbulence in the second fluid due to the presence of the first one, and decay of the turbulent kinetic energy. We also derive from it a "k-ϵ" model, which could be used for many applications.

40487 (UCRL—92385) Free-Lagrange methods for compressible hydrodynamics in two space dimensions. Crowley, W.P. (Lawrence Livermore National Lab., CA (USA)). 1 Mar 1985. Contract W-7405-ENG-48. 23p. (CONF-8503139—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012946.

From Free-lagrangian methods conference; Hilton Head Island, SC, USA (4 Mar 1985).

Since 1970 a research and development program in Free-Lagrange methods has been active at Livermore. The initial steps were taken with incompressible flows for simplicity. Since then the effort has been concentrated on compressible flows with shocks in two space dimensions and time. In general, the line integral method has been used to evaluate derivatives and the artificial viscosity method has been used to deal with shocks. Basically, two Free-Lagrange formulations for compressible flows in two space dimensions and time have been tested and both will be described. In method one, all prognostic quantities were node centered and staggered in time. The artificial viscosity was zone centered. One mesh reconnection philosphy was that the mesh should be optimized so that nearest neighbors were connected together. Another was that vertex angles should tend toward equality. In method one, all mesh elements were triangles. In method two, both quadrilateral and triangular mesh elements are permitted. The mesh variables are staggered in space and time as suggested originally by Richtmyer and von Neumann. The mesh reconnection strategy is entirely different in method two. In contrast to the global strategy of nearest neighbors, we now have a more local strategy that reconnects in order to keep the integration time step above a user chosen threshold. An additional strategy reconnects in the vicinity of large relative fluid motions. Mesh reconnection consists of two parts: (1) the tools that permit nodes to be merged and quads to be split into triangles etc. and; (2) the strategy that dictates how and when to use the tools. Both tools and strategies change with time in a continuing effort to expand the capabilities of the method. New ideas are continually being tried and evaluated. The successful ones stay in the code, and in some sense its intelligence increases with time. 7 refs., 13 figs.

40488 (UCRL—92921) Shock temperature measurements in ammonia. Radousky, H.B.; Mitchell, A.C.; Nellis, W.J.; Ross, M. (Lawrence Livermore National Lab., CA (USA)). Jul 1985. Contract W-7405-ENG-48. 7p. (CONF-850736—27). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014810.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

Our first shock temperature measurements on a cryogenic target are reported for NH_3. A new fast optical pyrometer and a cryogenic specimen holder for liquid NH_3 were developed to measure shock temperatures of 4400 and 3600 K at pressures of 61 and 48 GPa. These conditions correspond to those in the ice layers in Uranus and Neptune. The shock temperature data are in reasonable agreement with an equation of state based on an intermolecular potential derived from NH_3 Hugoniot data.

40489 (UCRL—92924) Fluids at high dynamic pressures and temperatures. Nellis, W.J.; Hamilton, D.C.; Trainor, R.J.; Radousky, H.B.; Mitchell, A.C.; Holmes, N.C. (Lawrence Livermore National Lab., CA (USA)). Jun 1985. Contract W-7405-ENG-48. 10p. (CONF-850759—6). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014812.

From 10. high pressure conference on research in high pressure science and technology; Amsterdam, Netherlands (8 Jul 1985).

Electrical conductivity data for shocked liquid nitrogen, Hugoniot data for liquid air, shock temperatures for liquid ammonia, and double-shock equation-of-state data for Al are discussed. 15 refs., 2 figs.

40490 **Gas flow in vertical slots with large horizontal temperature differences.** Chenoweth, D.R.; Paolucci, S. (Applied Mechanics Department, Sandia National Laboratories, Livermore, California 94550). *Physics of Fluids;* **28**: No. 8, 2365-2374(Aug 1985). Contract AC04-76DP00789.

Perfect gas exact solutions to the steady Navier—Stokes equations are given for laminar convective motion in open and closed vertical slots with large temperature differences using Sutherland law transport properties. The solutions are valid a few slot widths away from the ends in the asymptotic region where the opposite hot and cold wall boundary layers are fully merged. It is found that the static pressure (in the closed slot) and temperature and velocity distributions (in all cases) are very sensitive to property variations, even though the heat flux may not be. We observe the net horizontal and vertical heat fluxes to be the same as those obtained from the Boussinesq equations. Comparisons with constant property solutions and the well-known Boussinesq limiting solution for small temperature differences are given for examples using air.

40491 **Fragmentation of suddenly heated liquids.** Blink, J.A.; Hoover, W.G. (Lawrence Livermore National Laboratory, Livermore, California 94550 and Department of Applied Science, University of California, Davis, California 95616). *Physical Review* [*Section*] *A: General Physics;* **32**: No. 2, 1027-1035(Aug 1985). Contract W-7405-ENG-48.

The rapid fragmentation of two-dimensional high-pressure disks of Lennard-Jones fluid was studied using molecular dynamics. The free expansion of 169-, 721-, 2611-, and 14 491-particle systems was studied for several sound-traversal times. The breakup into fragments (or clusters) can be roughly described by Grady's model, which balances the surface energy with the comoving (dilational) kinetic energy of the fragments. The model predicts that the number of fragments varies as the cube root of the system population and the 2D/3 power of the initial pressure where D (2 or 3) is the dimensionality of the system. The molecular-dynamics results confirm these predictions within about +- 0.1 and thereby rule out three other fragmentation models. The relatively high monomer temperatures and relatively uniform fragment temperatures found here correspond to temperatures found in recent three-dimensional Lennard-Jones simulations by Vicentini, Jacucci, and Pandharipande.

40492 **Coupling of Rayleigh-like waves with zero-sound modes in normal ^{3}He.** Bogacz, S.A.; Ketterson, J.B. (Materials Science and Technology Division, Argonne National Laboratory, Argonne, Illinois, and Department of Physics and Astronomy, Southern Illinois University, Carbondale, Illinois). *Journal of Low Temperature Physics;* **60**: No. 1, 133-148(1 Jul 1985).

The Landau kinetic equation is solved in the collisionless regime for a sample of normal ^{3}He excited by a surface perturbation of arbitrary ω and k. The boundary condition for the nonequilibrium particle distribution is determined for the case of specular reflection of the elementary excitations at the interface. Using the above solution, the energy flux through the boundary is obtained as a function of the surface wave velocity ω/k. The absorption spectrum and its frequency derivative are calculated numerically for typical values of temperature and pressure. The spectrum displays a sharp, resonant-like maximum concentrated at the longitudinal sound velocity and a sharp maximum of the derivative concentrated at the transverse sound velocity. The energy transfer is cut off discontinuously below the Fermi velocity. An experimental measurement of the energy transfer spectrum would permit a determination of both zero-sound velocities and the Fermi velocity with spectroscopic precision.

40493 **Nodal coarse-mesh method for the efficient numerical solution of laminar flow problems.** Horak, W.C.; Dorning, J.J. (Brookhaven National Laboratory, Department of Nuclear Energy, Upton, New York 11973). *Journal of Computational Physics;* **59**: No. 3, 405-440(Jul 1985).

A coarse-mesh nodal method for the efficient numerical solution of incompressible laminar flow problems is developed using a transverse integration procedure followed by the introduction of locally-defined Green's tensors of the transverse-integrated in-node Navier-Stokes and mass conservation equations. In applications to 2-dimensional flow problems, including fully developed flow, inlet flow, and modified driven cavity problems (driven cavities with inlet and outlet sections), this new nodal Green's tensor method is demonstrated to have very high accuracy even when applied on very large nodes. The high accuracy of this new method on very coarse meshes leads to a high computational efficiency (reduced computer time for fixed accuracy requirements).

40494 **Efficient solution algorithms for the Riemann problem for real gases.** Colella, P.; Glaz, H.M. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Computational Physics;* **59**: No. 1, 264-298(Jun 1985). Contract AC03-76SF00098.

A procedure for constructing solutions to the Riemann problem for gas dynamics with a general convex equation of state is given. Approximate procedures, involving a local parametrization of the equation of state, are introduced in order to calculate numerical fluxes in conservative finite difference schemes. This leads to difference schemes which are as accurate and almost as fast as the analogous schemes for polytropic gases. Numerical results in one and two space variables are presented.

40495 **Oscillatory convection in a dilute ^{3}He—superfluid ^{4}He solution.** Maeno, Y.; Haucke, H.; Ecke, R.E.; Wheatly, J.C. (Los Alamos National Laboratory, Los Alamos, New Mexico). *Journal of Low Temperature Physics;* **59**: No. 3, 305-346(1 May 1985).

Convective instabilities in a rectangular, unity-aspect-ratio Rayleigh-Benard cell with a solution of 1.46% ^{3}He in superfluid ^{4}He have been studied in the temperature range 0.70—1.05 K, with a corresponding Prandtl number range of $0.045<\sigma<0.15$. The onset of stationary convection is much like that in a classical, one-component fluid. The oscillatory instability is studied by using an extremely sensitive local temperature probe. It is found that the total heat transport efficiency is suppressed by the oscillations in the entire range of Prandtl number we have studied. The local temperature probe indicates a striking difference in the oscillatory amplitude when the sense of rotation of the convective rolls is reversed. The magnitude of the convective velocity is deduced from both th initial slope of the Nusselt number near the onset of the stationary convection and the frequency of the oscillations. Determinations of the temperature dependence of the convective velocity using these two methods agree very well. The observed behavior of the oscillatory frequency and onset condition supports the theory of oscillatory convection for a classical, low-Prandtl-number, one-component fluid.

6450 High Energy Physics

40496 **(DOE/ER/02504—T3) High energy accelerator and colliding beam user group. Progress report, March 1, 1983-February 29, 1984.** (Maryland Univ., College Park (USA). Dept. of Physics and Astronomy). 1983. Contract AC05-76ER02504. 169p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE85014511.

Topics covered in this research summary include: status of the OPAL collaboration at LEP, CERN; two-photon physics at PLUTO; search for new particles at JADE; neutrinoless double beta decay at DESY; Fermilab jet experiment; neutrino deuterium experiment in the 15 foot bubble chamber at Fermilab; deep inelastic muon experiment at Fermilab; new experiments at the proton-antiproton collider; neutrino-electron scattering at Los Alamos; parity violation in proton-proton scattering; an upgrade of laboratory and computer facilities; and a study of bismuth germanate as a durable scintillation crystal. (GHT)

40497 **(INIS-mf—9311) Workshop on the future of intermediate energy physics in Europe. Proceedings.** Koch, H.; Scheck, F. (eds.). (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekttraegerschaft Mittelenergiephysik). 1984. 491p. (CONF-8404243—). NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453.

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

These proceedings contain the reviews, lectures, and articles presented at the named workshop. These concern weak interactions of hadrons, CP violation in the standard model and beyond, flavor mixing with CP violation, radiative weak decays, kaon and hyperon decays, electroweak interactions and neutrino physics, heavy neutrinos, the study of electroweak processes by the spallation neutron source, radiative corrections in the standard model, physics with proton, pion, and antiproton beams, charm, bottom, and Higgs search, wide angle hadron scattering, panti p physics above 2 GeV/c, strong interactions with strange particles, the lifetime of hypernuclei, electromagnetic probing of hadron structure and nuclear constituents, accelerators, as well as a kaon factory project. See hints under the relevant topics.

40498 **(LA—10429-PR) Progress at LAMPF, Clinton P. Anderson Meson Physics Facility, January-December 1984.** Allred, J.C. (ed.). (Los Alamos National Lab., NM (USA)). Apr 1985. Contract W-7405-ENG-36. 260p. NTIS, PC A12/MF A01; GPO Dep. File Number DE85015365.

Progress at LAMPF is the annual progress report of the MP Division of the Los Alamos National Laboratory. The report includes brief reports on research done at LAMPF by researchers from other institutions and Los Alamos divisions. Abstracts of separate sections of the report were prepared separately for the data base. (GHT)

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 39832, 40722

40499 **(ANL-HEP-CP—85-18) Summary of S = 0 dibaryon resonances and candidates.** Yokosawa, A. (Argonne National Lab., IL (USA)). 18 Apr 1985. Contract W-31-109-ENG-38. 46p. (CONF-8503146—1). NTIS, PC A03/MF A01; GPO Dep. File Number DE85012125.

From San Miniato topical seminar; San Miniato, Italy (25 Mar 1985).

Experimental data concerning S = O dibaryon resonances are reviewed, with an emphasis on the nucleon-nucelon system. Structures observed in the γd channel, the πd elastic scattering, pp $\rightarrow \pi$d channel, and other channels are discussed. Experimental data are compared with various theories. The short-range forces can be represented by dibaryon resonances. Further measurements to clarify the understanding of dibaryons are also discussed. 53 refs., 24 figs.

40500 **(BNL—36726) Brief report on a new limit on the strength of mixing between nu/sub μ/ $\rightarrow$ nu/sub e/.** Ahrens, L.A.; Aronson, S.H.; Connolly, P.L.; Gibbard, B.G.; Murtagh, M.J.; Murtagh, S.; Terada, S.; White, D.H.; Callas, J.L.; Cutts, D. (Brookhaven National Lab., Upton, NY (USA); Brown Univ., Providence, RI (USA); National Lab. for High Energy Physics, Oho, Ibaraki (Japan); Osaka Univ. (Japan); Pennsylvania Univ., Philadelphia (USA); State Univ. of New York, Stony Brook (USA)). 1985. Contract AC02-76CH00016. 4p. (CONF-850375—15). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015183.

From 20. Recontre de Moriond; Les Arcs, France (10 Mar 1985).

Measurements have been made of the reactions nu/sub e/n $\rightarrow e^- p$ and nu/sub μ/n $\rightarrow \mu^- p$ in a detector located 96 meters from the A.G.S. neutrino source. A direct measurement is made of the energy dependent flux ratio for the two neutrino species. After comparison to calculated energy dependence of this same ratio, an improved new limit of $\sin^2 2\alpha < 3.4 \times 10^{-3}$ (90% CL) at large Δm^2 is obtained. Possible systematic errors are estimated to be less than 20%. 5 refs., 5 figs.

40501 **(CERN-EP—84-85) p anti p annihilations at rest in hydrogen gas: report on preliminary results of the ASTERIX experiment at LEAR.** Ahmad, S.; Amsler, C.; Armenteros, R.; Auld, E.G.; Axen, D.; Bailey, D.; Barlag, S.; Beer, G.; Bizot, J.C.; Caria, M. (European Organization for Nuclear Research, Geneva (Switzerland); Mainz Univ. (Germany, F.R.); Technische Univ. Muenchen (Germany, F.R.); Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire; British Columbia Univ., Vancouver (Canada). TRIUMF Facility; Zurich Univ. (Switzerland)). 18 Jul 1984. 14p. (CONF-840379—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE85901050.

From 4. course on fundamental interactions in low energy systems; Erice, Italy (31 Mar 1984).

The ASTERIX experiment has been set up to study p anti p annihilations at rest into q anti q-mesons and other boson resonances. The experimental set-up is briefly described, followed by some preliminary experimental results. It is reported that the 2P level of the p anti p atom is reached in the atomic cascade in H_2 gas. In fully reconstructed annihilation channels involving, besides charged particles, 0 or 1 neutral particle, well known mesons are observed at their nominal masses. A continuous change in relative branching ratios was found, leading to the conclusion that one has 10 to 40% S wave and 60 to 90% P wave annihilation in atmospheric H_2 gas. (LEW)

40502 **(DESY—85-012) Consequences of models for monojet events from Z boson decay.** Baer, H.; Komamiya, S.; Hagiwara, K. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Feb 1985. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85752017.

Three models for monojet events with large missing transverse momentum observed at the CERN p anti p collider are studied: i) Z decay into a neutral lepton pair where one of the pair decays within the detecter while the other escapes, ii) Z decay into two distinct neutral scalars where the lighter one is long lived, and iii) Z decay into two distinct higgsinos where the lighter one is long lived. The first model necessarily gives observable decay in flight signals. Consequences of the latter two models are investigated in both panti p collisions at CERN and e^+e^- annihilation at PETRA/PEP energies.

40503 **(DOE/ER/03130—25) Progress report of a research program in experimental high energy physics, January 1, 1985-December 31, 1985. Task C.** Lanou, R.E. Jr. (Brown Univ., Providence, RI (USA). Dept. of Physics). 1 Jul 1985. Contract AC02-76ER03130. 68p. (COO—3130TC-25). NTIS, PC A04/MF A01; GPO Dep. File Number DE85014448.

An experimental program in strong and electro-weak interaction physics of elementary particles is being carried out using electronic detection techniques. Experiments have been performed or are being prepared utilizing the accelerators of the laboratories at Brookhaven and Fermilab. The experiments described in this report by the Electronic Detector Group include the following: (1) experiments to measure neutrino-electron scattering and other neutral current phenomena, (2) neutrino oscillation experiments at BNL, and (3) preparations for experiments at the FNAL anti PP Collider.

40504 **(DOE/ER/03130—259) Experimental high energy physics. Progress report, 1 January 1985-31 December 1985.** Widgoff, M. (Brown Univ., Providence, RI (USA)). 1 Jul 1985. Contract AC02-76ER03130. 63p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85014447.

An experimental program to study the interactions of hadrons, photons, and neutrinos is being carried out using hybrid systems which include bubble chambers as visible targets and counter spectrometers for particle detection, identification, and momentum measurements. Experiments have been run in both positive and negative hadron beams at Fermilab and with polarized photons at SLAC. Experiments with neutrino beams at Tevatron II at Fermilab are in progress and in preparation. In addition, we have joined in a collaboration to submit a Letter of Intent to build a detector for experiments at the new ep colliding beam accelerator HERA at

DESY. We have been analyzing the film and counter data of our one-million-picture exposure for the study of π^+, K^+ and p interactions in hydrogen and magnesium, silver and gold, at a beam momentum of 200 GeV/c (FNAL Experiments E-565 and E-570), as well as continuing the physics analysis of our earlier FNAL experiments on π^+ p, K^+ p and pp interactions at 147 GeV/c (FNAL Experiment E-299). During the past year analysis has continued on the data of SLAC experiments BC72/73/75, studying the interactions in hydrogen of 20 GeV polarized photons. Results have been obtained on photoproduction of charm and on the lifetimes of charmed particles, and on vector meson and strange particle production. Inclusive γp interactions are being studied in detail in this high statistics sample. The hybrid detector for neutrino studies at Tevatron II is operating at Fermilab, as a test for E636, the tau neutrino search to be run in a neutrino beam from a beam dump, and we are collecting data on muon neutrino interactions in the high Q^2 region made accessible for the first time by the Tevatron (E745). Brown built scintillator hodoscopes for the trigger system of the detector. Data including holographic photographs of the Tohoku one-meter bubble chamber are being obtained, and film analysis has begun.

40505 **(DOE/ER/03244—110) Investigation of the anti pp → xi (2220) → K/sub s/K/sub s/ reaction at LEAR.** Hertzog, D.W. (Carnegie-Mellon Univ., Pittsburgh, PA (USA)). 1985. Contract AC02-76ER03244. 6p. (CONF-850152—6). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014325.

From 3. LEAR workshop; Tignes-Savoie, France (19 Jan 1985).

Measurement of the total and differential cross section of the reaction anti pp → K/sub s/K/sub s/ in a fine momentum scan corresponding to the mass range of the ξ (2220) was proposed. The mass and width of such a resonance coupling to anti pp can be determined to better than 500 keV and additionally the spin can be established from the differential cross section. Only modest additions to our existing threshold detector and antiproton beam intensities currently available at LEAR are required for these studies. 14 refs.

40506 **(DOE/ER/03244—111) Strange particle production in anti PP annihilation processes.** Barnes, P.D. (Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Physics). 1985. Contract AC02-76ER03244. 11p. (CONF-850315—9). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014326.

From Conference on antinucleon and nucleon-nucleus interactions; Telluride, CO, USA (18 Mar 1985).

Nucleon-Antinucleon annihilation is inherently a short range (≦ 1 f.) process involving a spatial overlap of the two hadrons. This feature has stimulated much theoretical interest in this process as a testing ground for models of the underlying quark degrees of freedom. Microscopic models have been proposed to describe annihilation into both two and three meson final states, in both strange and nonstrange channels, and into nonmesonic two hyperon final states. The main issues in the analysis of mesonic final states are reviewed. A new investigation at LEAR of anti ΛΛ production in anti PP collisions near threshold is discussed. A proposed study of the reaction anti PP → K/sub s/K/sub s/ is described in the context of a search for the ξ(2220) resonance.

40507 **(DOE/ER/03244—113) Search for a strangeness -2 dibaryon.** Franklin, G.B. (Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Physics). 1985. Contract AC02-76ER03244. 6p. (CONF-8504133—6). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014328.

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

The existing data on the strangeness -2 two-baryon mass spectrum is reviewed and a new experiment is proposed to explore this spectrum from 100 MeV below the mass of the lightest known two-baryon strangeness -2 system, ΛΛ, to 20 MeV above the ΛΛ mass. The proposed experiment is motivated by Jaffe's 1977 prediction of a six-quark object with strangeness -2 and J/sup π/ = 0^+ at a mass of 2150. This particle, called the "H", has been predicted by later bag models as well. Calculations indicate the proposed experiment will be a sensitive test of the dibaryon theories. 12 refs.

40508 **(DOE/ER/03244—114) Search for the xi(2220) at LEAR.** Hertzog, D.W.; Barnes, P.D.; Diebold, G.E.; Franklin, G.; Maher, C.; Quinn, B.; Seydoux, J.; Szymanski, J.; Kilian, K.; Besold, R. (Carnegie-Mellon Univ., Pittsburgh, PA (USA); European Organization for Nuclear Research, Geneva (Switzerland); Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.); Freiburg Univ. (Germany, F.R.); Illinois Univ., Urbana (USA); Rice Univ., Houston, TX (USA). Bonner Nuclear Labs.). 1985. Contract AC02-76ER03244. 6p. (CONF-8504133—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014329.

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

Since the revelation of the narrow resonance at 2220 MeV in the K anti K final states of the radiative decay J/Psi-δX at SLAC, much theoretical and experimental effort has been devoted to the understanding of this unusual object. Theoretical explanations range from the conventional to the exotic. The experimental evidence, however, rests solely on one experiment and is not of sufficient quality to distinguish among the intriguing possibilities. We describe an experiment which would be ideal to measure precisely the properties of the ξ, including its mass, width, and angular momentum.

40509 **(DOE/ER/40025—36) Charm and heavy flavor lifetimes.** Ford, W.T. (Colorado Univ., Boulder (USA). Dept. of Physics). Mar 1985. Contract AC02-81ER40025. 33p. (CONF-850146—8). NTIS, PC A03/MF A01; GPO Dep. File Number DE85014901.

From Aspen winter physics conference; Aspen, CO, USA (14 Jan 1985).

Recent measurements of the lifetimes of charm and bottom hadrons and of the tau lepton are reviewed. The current status of weak interaction universality, flavor mixing and models relating quark to hadron decay are discussed. 25 refs., 11 figs.

40510 **(DOE/ER/40033—78) Range of validity of KNO scaling.** Belforte, S.; Goulianos, K. (Rockefeller Univ., New York (USA)). 1985. Contract AC02-81ER40033. 5p. (CONF-850375—9). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85013596.

From 20. Recontre de Moriond; Les Arcs, France (10 Mar 1985).

When diffractive and non-diffractive charged multiplicity distributions are considered independently, we find that KNO-scaling extends from a few GeV to at least ~60 GeV, and possibly even to the SppS Collider energy of 540 GeV.

40511 **(EFI—615(5)-83) Analysis of cumulative proton angular distributions.** Alanakyan, K.V.; Demirchyan, R.A.; Egiyan, K.Sh.; Sharabyan, Yu.G.; Stepanyan, S.G. (Erevanskij Fizicheskij Inst. (USSR)). 1983. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701790.

An analysis of angular distributions of cumulative protons produced by primary γ-quanta and hadrons is presented. It is shown that these distributions: 1) are successfully described by the exponential dependence fsub(p)(cosnusub(p)) = Cexp(bsub(p)cosnusub(p)); 2) strongly depend on proton momenta; 3) are universal with respect to primary energy beginning with approximately 1 GeV for light particles (γ-quanta and π-mesons) and with 2-3 GeV for protons; 4) are universal with respect to the target-nucleus beginning with 50; 5) all other conditions being equal, they are identical for primary light particles (γ-quanta and π-mesons) and come to be steeper for primary protons. The analysis of angular distributions of cumulative protons at Tsub(p) = 0 shows that energy spectra of these protons interest at energies Tsub(p) not equal to 0, the crossover point on a scale of Tsup(p) being essentially dependent on the interaction type, target-nucleus and primary energy. 15 references, 59 figures.

40512 **(EFI—624(14)-83) Cross-section assymmtry of πi and π^- meson single photoproduction on nucleons by polarized photons in the resonance energy range.** Agababyan, K.Sh.; Agan'yants, A.O.; Adamyan, F.V. (Erevanskij Fizicheskij Inst. (USSR)). 1983. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701791.

Preliminary measurement results for the cross-section asymmetry of the reaction $\gamma n \rightarrow \pi^- p$ in the range of angles thetasub(πsup(-))sup(c.m.s.) = 50 deg - 120 deg at Esub(γ) = 1.05 GeV as well as the cross-section asymmetry of the reaction $\gamma p \rightarrow \pi^+ n$ for the angles thetasub(πsup(+))sup(c.m.s.) = 50 deg, 60 deg at Esub(γ) = 1.05 GeV are presented. The experiment is performed on the linearly polarized photon beam of the Yerevan synchrotron. 12 references, 3 figures, 2 tables.

40513 (EFI—643(33)-83) Observation of correlations between backward-protons yield and relative yield of $\pi i/\pi^-$-mesons in nucleus-nucleus collisions at 4.2 GeV/c momentum per nucleon. Gulkanyan, G.R.; Kirakosyan, Z.A.; Korchagin, S.A; Ravinovich, I.M. (Erevanskij Fizicheskij Inst. (USSR)). 1983. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701792.

The correlation between the ratio of momentum spectra of low-energy π^{+-}-mesons (Psub(π)=100-500 MeV/c) and production of backward-protons in the interactions of p, d, He, with ^{12}C at 4.2 GeV/c momentum per nucleon is investigated. Experimental results indicate that a noticeable contribution in the process of backward-proton production is made by the secondary π^+-meson absorption on a pair of nucleons in nucleus (in the momentum range of Psub(π) = 150-250 MeV/c). 7 references, 3 figures.

40514 (FNAL/C—85/84) p anti p collider physics: summary talk. Bjorken, J.D. (Fermi National Accelerator Lab., Batavia, IL (USA)). Jun 1985. Contract AC02-76CH03000. 24p. (CONF-8503151—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014782.

From International symposium on physics of proton-antiproton collision; Tsukuba, Japan (13 Mar 1985).

Progress is very briefly summarized in these areas: Drell-Yan production of W and Z; inclusive spectra of jets; angular distribution of two jet final states; Dalitz plot analysis of three jet final states; interior structure of jets; minijets; issues and relevent data in soft-collision physics; structure of the pomeron; W, Z, and electroweak theory; heavy quark physics; extinct exotica; extant exotica, including monojets, the top quark, and possibly anomalous same-sign isolated dimuons. Future directions are anticipated for the Sp anti pS, Tevatron I, instrumentation and detectors, group theory, and the physics at SSC energies. 39 refs., 18 figs. (LEW)

40515 (IAE—3739/2) Experiments on the search for magnetic monopoles. Kotov, M.A.; Ogurtsov, V.V.; Filippov, A.A.; Khakimov, S.Kh. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1983. 32p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701786.

Experiments on the search for magnetic monopoles in cosmic radiation, in different substances on the Earth and at accelerators are described. It is noted that the flux of cosmic monopoles is very small and its reliable registration requires too much effort. At the same time there are ferromagnetic materials on the Earth that could accumulate monopoles for millions of years. The upper limit of the flux of cosmic monopoles is estimated. Experiments at accelerators that constitute the most numerable group of investigations are discussed. The evaluations of upper boundary of cross section for birth of monopoles by accelerated particle fluxes are estimated. 36 references, 14 figures, 2 tables.

40516 (IFVE—84-54) Charged particle multiplicity in K^+p interactions at 70 GeV/c. Gritsaenko, I.A.; Ron'zhin, V.M.; Fenyuk, A.B.; Shlyapnikov, P.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 8p. (In Russian). (OEIPK-WA—27). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701797.

Results are presented on the charged particle multiplicity in the K^+p interactions at 70 GeV/c obtained in the experiment with the bubble chamber BEBC. They are compared with other K^+p experiments in the momentum range from 3 up to 250 GeV/c. 13 references, 5 figures, 3 tables.

40517 (IFVE-OEF—84-97) Total hadron interaction cross section growth. Prokoshkin, Yu.D. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701793.

The energy dependence of total cross sections of hadron interactions at high energies is considered. The growing, non-Regge part of the total cross section exhibits the universality, it does not depend on the type of a particle. The features of the total cross sections are discussed in connection with the hypothesis on the gluonic nature of the cross section growth. 21 references, 4 figures, 3 tables.

40518 (IFVE-OEF—84-98) Exclusive production and decay of glueballs. Prokoshkin, Yu.D. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701794.

Possibilities to separate glueballs from the background of quark meson states are discussed. The experimental method is considered in which glueball signal is enchanced both in the production reaction (in the central collision region) and in the decay process into pseudoscalar mesons. The peculiarities of the detection of multiphoton final states produced in glueball decays, Using GAMS-type spectrometer, at energies near the threshold and in the TeV-range are discussed. 34 references, 7 figures.

40519 (IFVE-ONF—83-143) Compton effect on πp meson. Antipov, Yu.R.; Batarin, V.A.; Bezzubov, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1983. 14p. (In Russian). (SERP-E—143). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701795.

The reaction $\pi^- A \rightarrow A\pi^-\gamma$ at 40 GeV/c was studied on the Sigma spectrometer on Be, C, Al, Fe, Cu, Pb nuclear targets in the range of four-momentum transfer excitation < 0.05 (GeV/c)^2. A phenomenon of elastic scattering of pions on the nuclear Coulomb field photons was observed, its total and differential cross sections were measured. The cross section of compton effect on π^--meson was determined. 14 references, 10 figures.

40520 (IFVE-ONF—83-173) Properties of multiplicity distributions in nuA and antinuA interactions at Esub((anti nu)) <= 30 GeV. Baranov, D.S.; Chabrov, N.A.; Filippov, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1983. 20p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701787.

We present data on the multiplicity structure of inclusive charge hadron production in charged current neutrino and antineutrino freon interactions in the energy range of 3-30 GeV. Average multiplicities, dispersions and correlation coefficients are investigated. Furthermore, KNO-scaling is studied and average net charges are calculated in different kinematical regions. Our data are compared with results from interactions on an isoscalar target of free nucleons with the view to study the influence of nuclear effects. 20 references, 11 figures, 2 tables.

40521 (IFVE-ONF—84-69) Estimate of hadron formation length in neutrino interactions. Baranov, D.S.; Ermolaev, V.I.; Ivanilov, A.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701788.

The formation length of hadrons produced in neutrino interactions in the framework of the intranuclear cascade model using the data on proton multiplicity is estimated. It follows from this estimate that hadrons with an energy greater than several GeV escape the nucleus without interaction. The experiment was done on the bubble chamber SCAT filled with freon (CF_3Br). A cascade model, where the formation length of neutrino produced hadrons is taken into account, is in agreement with the experimental data, in

particular with the cumulative proton emission. 33 references, 3 figures, 2 tables.

40522 **(IFVE-OTF—84-85) Spin effects in hadron interactions at high energies.** Troshin, S.M.; Tyurin, N.E. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701796.

Spin effects in π^{+-}, K^{+-}p, pp inelastic scattering and in inclusive hyperon production in hadron interactions at high energies are discussed. Theoretical approaches to the description of these effects are also considered. 35 references, 6 figures, 3 tables.

40523 (INIS-mf—9311, pp 98-101) **Experimental status and prospects of flavour mixing and CP violation.** Kleinknecht, K. (Dortmund Univ. (Germany, F.R.). Inst. fuer Physik). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

The mixing of quarks through the weak interaction is described by a unitary matrix which can be parametrized in terms of three angles and one phase. Experimental results on weak decays of hyperons and B mesons, on neutrino production of charm quarks, and on the B meson lifetime are used to obtain, in a combined fit, values for the three mixing angles in the Kobayashi-Maskawa scheme: sin theta$_1$ = 0.231 +- 0.003, 0.025 < sin theta$_3$ < 0.06 and sin theta$_3$ +- 0.02. In the Maiani parametrization, the angles obtained are: sin theta = 0.231 +- 0.003, vertical strokesin γvertical stroke=0.044 (+0.007 -0.005) and sin β < 0.004. Future prospects for experiments on flavour mixing and CP violation are discussed.

40524 (INIS-mf—9311, pp 105-109) **Experimental aspects of kaon and hyperon decays.** Siebert, H.W. (Heidelberg Univ. (Germany, F.R.). Physikalisches Inst.). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

In this lecture I give a necessarily incomplete picture of the achievements and future possibilities of experiments on kaon and hyperon decays. The emphasis here is on decays of charged kaons, which will be treated in part I, while part II will deal with hyperon decays.

40525 (INIS-mf—9311, pp 85-91) **Status and outlook in searches for heavy neutrinos.** Deutsch, J. 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

We elaborated somewhat on the opinion that the up-to-now so successful standard model is rather unsatisfactory to the extent that it does not offer any natural explanation to the mass-spectrum of the particles and - in particular - to the ad-hoc assumption of strictly zero-mass neutrinos. Aesthetical prejudice and even the very idea of grand unification would call instead for a finite neutrino mass without offering, unfortunately, any unique prediction on the mass-values to be expected. Under these circumstances, the only reasonable attitude for the experimentalist seems to consist in pushing further the mass-limits whenever this becomes technically feasible, searching for eventual hints of a world beyond the standard model.

40526 (INIS-mf—9311, pp 102-104) **Electroweak processes at a neutron spallation source.** Radermacher, E. (Technische Hochschule Aachen (Germany, F.R.). Lehrstuhl fuer Experimentalphysik 3B und 3. Physikalisches Inst.). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

We are restricted to neutrino interactions when electroweak processes should be studied at a neutron spallation source (Rutherford, Juelich), or some other meson factory (Lampf, SIN, Triumph).

40527 **(ITEP—39(1983)) Measurement of np elastic scattering at high energies and very small momentum transfers.** Arefiev, A.; Babaev, A.; Bamberger, A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1983. 52p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701798.

The np elastic scattering differential cross section has been measured for incident neutron momenta 100-400 GeV/c in the t range 6 x 10^{-4} - 5 x 10^{-1} (GeV/c)^2. The np-data of this experiment provide a direct measurement of the hadronic amplitude for t < 10^{-2} (GeV/c)^2, which is consistent with the extrapolations from higher t values. In data obtained for t < 10^{-4} (GeV/c)^2 there is an indication of a rise which can be attributed to Schwinger scattering. There are obtained σsub(tot)sup(np) = (39.6 +- 0.6) mb and σsub(el)sup(np) = (7.05 +- 0.22) mb at <p> = 310 GeV/c, where <p> is a mean laboratory momentum. This gives a ratio σsub(el)sup(np)/σsub(tot)sup(np) = 0.178 +- 0.008, which is in good agreement with pp-data at ISR energies. 12 references, 20 figures.

40528 **(ITEP—110(1983)) Ratio of the x-distributions for antineutrino interactions in neon and deuterium.** Astratyan, A.E.; Efremenko, V.I.; Fedotov, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1983. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701771.

The ratio R(x) = (dN/dx)sup(Ne)/(dN/dx)sup(D) of the x-distributions (x = Q^2/2Mnu is the usual scaling variable, Q^2=-(psub(nu)-psub(μ))sup(2) is the squared 4-momentum transferred to hadrons, nu = Esub(nu) - Esub(μ) is the energy transfer, M is the nucleon mass) is reported for anti nusub(μ)Ne and anti nusub(μ)D bubble chamber data taken in IHEP and another experiments, respectively. The R(x) behaviour is contrary to that expected from Fermi motion picture. The observed effect in the range 0.1 < x < 0.7 is analogous to the variation of Fsub(2)sup(Fe)(x)/Fsub(2)sup(D)(x) (where Fsub(2)sup(Fe) and Fsub(2)sup(D) are the nucleon structure functions from iron and deuterium) as reported by the EMC group. 10 references, 2 figures.

40529 **(JINR—1-83-569) Detection and analysis of neutrino interactions with nuclei in photoemulsion at IHEP accelerator (Serpukhov).** Batusov, Yu.A.; Bunyatov, S.A.; Kuznetsov, O.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1983. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701789.

The results of detection and analysis of neutrino interactions with nuclei in photoemulsion at IHEP accelerator (Serpukhov) at 2-30 GeV neutrino energy are presented. 13 interactions of neutral particles are detected in two runs of emulsion irradiation. Nine of them are integrated as neutrino interactions hns b(μ)N(-) μsup(-)X, caused by weak charged current. 20 references, 4 figures, 3 tables.

40530 **(JINR—E-1-84-280) 2$^-$ resonances in the $\pi^+\pi^-\pi^-$ systems.** Bellini, G.; Corato, M.; Frabetti, P.L. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1984. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701799.

A partial-wave analysis has been performed for approximately 120000 $\pi^+\pi^-\pi^-$ events coherently produced on nuclear targets in a π-beam of 40 GeV Partial wave intensities and a large phase variation prove the resonant nature of the A$_3$-meson in the jsup(pc) = 2^{-+} partial wave. The resonance behaviour of the 2$^-$ partial wave has been determined in the fnu, pπ, epsilonπ decay mode. The position method, using all available information about intensities and phases of partial waves. The position of the stable pole in the amplitude in the lower half of the complec energetic plane has been found, wchich is respons ble for the resonance position. The resonance parameters are as follows: msub(2 2sup(-)s) = (1624+-21) MeV/c^2, <-> gitasub(2sup(-)s) = (304 +- 22) MeV; msub(2sup(-)p) = (1622 +- 35) MeV/c^2, <-> gitasub(2sup(-)p) = (404 +- 108) MeV; m msub(2sup(-)d) = (1693 +- 28) MeV/c^2, <-> gitasub(2sup(-)d)=(330+-90) MeV. The production cross-sec-

tion is equal to (37 +- 5) μb/nucleon. Evidence has been found for new resonances in the $1^+,2^-,2^+$ waves. 12 references, 6 figures.

40531 (JINR—R-1-84-311) Measurement of polarization in the $\pi p p \rightarrow \pi^0 n$, $\pi^0 \rightarrow 2\gamma$ reaction at the momentum of 40 GeV/c with detection of all reaction products. Borisov, N.S.; Kazarinov, Yu.M.; Liburg, M.Yu. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701800.

The result of polarization measurement in the charge-exchange reaction $\pi^- p$-$\pi^0 n$ is given. In this case the use of elastic kinematics as selection criterion permitted to considerably decrease the background from complex nuclei, which are present in polarized proton target and the kinematics permitted to considerably decrease the contribution made by inelastic reactions proceeding with the production of π^0-mesons, and in its turn, the fact permits to exclude to a great extent the main sources of systematic errors. The obtained data on polarization in the range of momenta transferred $0< t <2$ (GeV/s)^2 are presented. 17 references, 9 figures, 2 tables.

40532 (JINR—R-1-84-657) Experimental study on the $\pi i p \rightarrow K^+ \Sigma^+$ reaction at 12 GeV/c. Bitsadze, G.S.; Budagov, Yu.A.; Vinogradov, V.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701801.

The results on the study of the $\pi^+ p \rightarrow K^+ \Sigma^+$ reaction at 12 GeV/c are presented. The differential cross section in t sub(min) < t < 0.8(GeV/c)^2 momentum transfer range is measured. The Σ^+ polarization for t < 0.5(GeV/c)^2 is determined. The presented results make the available data more precise. The $\pi^+ p \rightarrow K^+ \Sigma^+$ binary reaction was selected by analyzing the missing mass for the forward emitted fast K meson. The total cross section in the studied momentum transfer range is 20.2 +- 2.4 μb with making allowance for the measurement systematic error. The experimental results are compared with the predictions by the Regge-pole models which take into account effects of rescattering and secondary singularities. 17 references, 7 figures, 2 tables.

40533 (JINR—R-1-84-658) Differential cross section of the $\pi i p \rightarrow K^+ \Sigma^+$ (1385) reacton at 12 GeV/c. Bitsadze, G.S.; Budagov, Yu.A.; Vinogradov, V.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1984. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701802.

Experimental results on the measurement of differential cross section of the $\pi^+ p \rightarrow K^+ \Sigma^+$ (1385) reaction at 12 GeV/c for 0.006(GeV/c)^2 < t < 0.8(GeV/c)^2 momentum transfer range are presented. The missing mass method for the reaction identification is used. The total cross section for t < 0.8 (GeV/c)^2 is equal to 7.3 + 1.1 μb with making allowance for the measurement systematic error. The cross section behaviour points to practical absence of contribution of the spin non-flip amplitude. 10 references, 3 figures, 2 tables.

40534 (LBL—19618) Limits for supersymmetry from a comprehensive study of CERN missing-energy events. Barnett, R.M. (Lawrence Berkeley Lab., CA (USA)). Apr 1985. Contract AC03-76SF00098. 10p. (CONF-850375—13). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014530.

From 20. Recontre de Moriond; Les Arcs, France (10 Mar 1985).

We have performed a comprehensive analysis of supersymmetric processes which can lead to missing-energy events such as those observed by the UA1 collaboration. Several critical aspects of the theoretical analysis are discussed here including fragmentation, backgrounds, and evolution of gluinos. When the experimentalists publish their final data, excellent limits will be set for M/sub g/ and M/sub q/, and it is possible that certain mass regions will not be excluded as explanations of the data.

40535 (LPNHEX-T—84-01) Nuclear effect study on nucleon structure functions, in comparison with antineutrino interactions on neon and deuterium. Vallee, C. (Ecole Polytechnique, 91 - Palaiseau (France). Lab. de Physique Nucleaire et des Hautes Energies; Paris-11 Univ., 91 - Orsay (France)). Mar 1984. 165p. (In French). NTIS (US Sales Only), PC A08/MF A01. File Number DE85751935.

We have studied the nuclear effects on high energy antineutrino charged current interactions by comparing the data which were taken in the Bubble Chamber BEBC filled with Neon and Deuterium. On the one hand, the study of nuclear reinteractions gave us the possibility to estimate the formation time of hadrons. On the other hand, the comparison of structure functions does not show any significant difference between Neon and Deuterium. Though this result does not contradict the effects observed with charged leptons by the EMC and SLAC experiments, it is strongly incompatible with certain theoretical interpretations which implied a stronger effect in antineutrino interactions.

40536 (MPI-PAE/Exp.El.—146) Polarization of Λ hyperons produced inclusively in νp and anti νp charged current interactions. Jones, G.T.; Kennedy, B.W.; O'Neale, S.W.; Boeckmann, K.; Gebel, W.; Geich-Gimbel, C.; Nellen, B.; Cooper-Sarkar, A.M.; Grant, A.; Klein, H. (Max-Planck-Institut fuer Physik und Astrophysik, Muenchen (Germany, F.R.). Werner-Heisenberg-Inst. fuer Physik). Jan 1985. 20p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85752024.

Lambda hyperons from νp and anti np charged current interactions have been analysed for polarization. A significant polarization is observed for Λ particles in the quasi-elastic region for both types of interactions. Part of this polarization is due to the decay of highly polarized Σ(1385) resonances. The results are compared with simple predictions of the quark parton model.

40537 (MPI-PAE/Exp.El.—148) Observation of Bsup(*) production in $e^+ e^-$ interactions above the b-flavor threshold. Han, K.; Klopfenstein, C.; Mageras, G.; Dietl, H.; Eigen, G.; Fonseca, V.; Franzini, P.; Horstkotte, J.E.; Imlay, R.; Lee-Franzini, J. (Max-Planck-Institut fuer Physik und Astrophysik, Muenchen (Germany, F.R.). Werner-Heisenberg-Inst. fuer Physik). Mar 1985. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85752025.

We have observed production of monochromatic low energy photons in $e^+ e^-$ interactions between 10.6 and 11.2 GeV/c^2. This signal is interpreted as due to the decay B* -> B+γ and is the first experimental evidence for the existence of vector banti u or banti d bound states. We determine the mass difference of the vector and pseudoscalar states, M(B*)-M(B), to be 52+-2+-4 MeV.

40538 (OUP—84-16) Charmonium spectroscopy in proton-antiproton annihilation. Bugge, L. (Oslo Univ. (Norway). Fysisk Inst.). Apr 1984. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781051.

CERN Intersection Storage Rings.

An experiment set up at the CERN ISR to study charmonium spectroscopy in proton-antiproton annihilation is described. A cooled, well defined antiproton beam hits a dense molecular H*sb2* gas jet target giving a luminosity of pparox. 5 x 10*sp30*cm*sp-2*s *sp-1*. Masses and widths are obtained to witin 500 keV. Results from tests runs are briefy discussed.

40539 (RAL—84-087) Do protons decay. Litchfield, P.J. (Rutherford Appleton Lab., Chilton (UK)). Sep 1984. 8p. (CONF-840795—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781046.

From 7. European symposium on antiproton interactions; Durham, UK (9 Jul 1984).

The experimental status of proton decay is reviewed after the Leipzig International conference, July 1984. A brief comparative description of the currently active experiments is given. From the overall samples of contained events it can be concluded that the experiments are working well and broadly agree with each other. The candidates for proton decay from each experiment are examined. Although several experiments report candidates at a higher

rate than expected from background calculations, the validity of these calculations is still open to doubt.

40540 (RAL—84-110) Observations of a very long-lived D-bar^0 decay to $K^+\pi^+\pi^-\pi^-$ with a proper flight time of 55 x 10^{-13} seconds. (Rutherford Appleton Lab., Chilton (UK)). Oct 1984. 12p. (SLAC-PUB—3493). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781052.

Submitted to Physical Review Letters.

The characteristics of a very interesting event recently found in an exposure of the SLAC Hybrid Facility to 20 GeV photons are discussed. This event contains two decays and is consistent with the production and decay of two charmed particles. The longer decay, of length 9mm, fits the hypothesis D-bar$^0 \rightarrow K^+\pi^+\pi^-\pi^-$ and has a proper flight time of 55 x 10^{-13}s. Possible background sources for this event are investigated and found to be extremely small.

40541 (RAL—85-001) Particle physics experiments 1984. Stuart, G. (Rutherford Appleton Lab., Chilton (UK)). Jan 1985. 298p. NTIS (US Sales Only), PC A13/MF A01. File Number DE85781050.

The Rutherford Appleton laboratory report describes work carried out in 1984 on experiments approved by the Particle Physics selection panel. The contents consist of unedited contributions from each experiment.

40542 (SLAC—282) Radiative decays of the psi prime to all-photon final states. Lee, R.A. (Stanford Linear Accelerator Center, CA (USA)). Jun 1985. Contract AC03-76SF00515. 157p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE85014895.

Results of studies of selected radiative decays of the psi' to charmonium and non-charmonium states which decay into photons are presented. These studies were performed using a sample of 1.8 x 10^6 produced psi''s collected by the Crystal Ball detector at the SPEAR electron-positron storage ring. The branching ratios of the chi$_0$, chi$_2$, and eta'/sub c/ to two photons have been measured to be (4.5 +- 2.2 +- 2.0) x 10^{-4}, (9.5 +- 2.9 +- 4.5) x 10^{-4} (first errors statistical, second systematic), and $<1 \times 10^{-3}$ (90% C.L.). The signal from the decay chain psi' $\rightarrow \gamma$chi$_0$, chi$_0 \rightarrow \pi^0\pi^0$ has been observed with essentially no background. Using the observed line shape of the radiative photon in this reaction, the full width of the psi$_0$ has been found to be 8.8 +- 1.3 +- 1.5 MeV/c^2. In addition, the branching ratios of the chi$_0$ and chi$_2$ to $\pi^0\pi^0$ have been measured to be (3.5 +- 0.3 +- 1.2) x 10^{-3} and (1.2 +- 0.2 +- 0.4) x 10^{-3}; the branching ratios of the chi$_0$ and chi$_2$ to eta eta have been measured to be (2.8 +- 0.9 +- 1.3) x 10^{-3} and (8.4 +- 4.2 +- 4.0) x 10^{-4}. The decays of the psi' to four non-charmonium states have been investigated. The branching ratios and upper limits of these decays have been normalized to the branching ratios of the corresponding decays from the J/psi which have been measured using a sample of 2.2 x 10^6 produced J/psi's collected by the Crystal Ball detector. The ratios of the psi' branching ratios to the J/psi branching ratios for the final states γeta, γeta', γtheta, and γf have been measured to be $<1.8\%$, $<2.6\%$, <10 to 15%, and 9 +- 3%. These results are compared with the theoretical expectations of lowest-order quantum chromodynamics potential models. Substantial disagreement is found between theory and experiment.

40543 (SLAC-PUB—3676) Radiative decays of the psi' to all-photon final states. Lee, R.A. (California Univ., Santa Cruz (USA). Inst. for Particle Physics; Stanford Linear Accelerator Center, CA (USA)). May 1985. Contract AC03-76SF00515. 8p. (CONF-850375—11). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014364.

From 20. Recontre de Moriond; Les Arcs, France (10 Mar 1985).

A sample of 1.8 x 10^6 produced psi's collected by the Crystal Ball detector at SPEAR is used to measure branching ratios of selected radiative psi' decays to non-charmonium states which decay into photons. A sample of 2.2 x 10^6 produced J/psi's is used to measure the same radiative decays from the J/psi. The ratios BR(psi' $\rightarrow \gamma$f)/BR(J/psi $\rightarrow \gamma$f) = 9 +- 3%, BR(psi' $\rightarrow \gamma\theta$)/BR(J/psi $\rightarrow \gamma\theta$) < 10% - 15%, BR(psi' $\rightarrow \gamma$eta)/BR(J/psi $\rightarrow \gamma$eta) < 1.8%, and BR(psi' $\rightarrow \gamma$eta')/BR(J/psi $\rightarrow \gamma$eta') < 2.6% have been obtained. (Upper limits are 90% confidence level. The upper limit for the radiative decay to the θ is uncertain due to the possible presence of an f' signal in the J/psi data). Assuming these decays proceed via the annihilation of the initial quark and antiquark to a photon and two gluons, these ratios are predicted by lowest order QCD to be the same as the ratio of leptonic branching ratios of the psi' and J/psi, or 12.0 +- 2.2%. There currently exists no compelling explanation for the discrepancy between the ratios measured for the last two decays and the theoretical expectation.

40544 (SLAC-PUB—3680) 3081/E processor and its on-line use. Rankin, P.; Bricaud, B.; Gravina, M.; Kunz, P.F.; Oxoby, G.; Trang, Q.; Ferran, P.M.; Fucci, A.; Hinton, R.; Jacobs, D. (Stanford Linear Accelerator Center, CA (USA); European Organization for Nuclear Research, Geneva (Switzerland)). May 1985. Contract AC03-76SF00515. 5p. (CONF-850579—5). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013069.

From 4. topical conference on computerized data acquisition in particle and nuclear physics; Chicago, IL, USA (19 May 1985).

The 3081/E is a second generation emulator of a mainframe IBM. One of it's applications will be to form part of the data acquisition system of the upgraded Mark II detector for data taking at the SLAC linear collider. Since the processor does not have direct connections to I/O devices a FASTBUS interface will be provided to allow communication with both SLAC Scanner Processors (which are responsible for the accumulation of data at a crate level) and the experiment's VAX 8600 mainframe. The 3081/E's will supply a significant amount of on-line computing power to the experiment (a single 3081/E is equivalent to 4 to 5 VAX 11/780's). A major advantage of the 3081/E is that program development can be done on an IBM mainframe (such as the one used for off-line analysis) which gives the programmer access to a full range of debugging tools. The processor's performance can be continually monitored by comparison of the results obtained using it to those given when the same program is run on an IBM computer. 9 refs.

40545 (SLAC-PUB—3686) Search for new effects in e^+e^- interactions. Bloom, E.D. (Stanford Linear Accelerator Center, CA (USA)). May 1985. Contract AC03-76SF00515. 16p. (CONF-850278—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014365.

From 5. topical workshop on proton-anti-proton collider physics; St. Vincent, Italy (25 Feb 1985).

Recent measurements of R, the ratio of the total hadron cross section to the lowest order muon pair cross section, are discussed which have systematic overall scale errors on the absolute value of R of 7% or less. Experiments are reviewed that have sought exotic effects in e^+e^- at the highest available energies. The search for narrow states in the radiative decays of the J/psi and Y are also reviewed. 35 refs., 24 figs. (LEW)

40546 Analyzing powers in πi p elastic scattering at intermediate energies. Mokhtari, A.; Briscoe, W.J.; Eichon, A.D.; Fitzgerald, D.H.; Kim, G.J.; Nefkens, B.M.K.; Wightman, J.A.; Adrian, S.D.; Sadler, M.E.; Walker, T. (Department of Physics, University of California, Los Angeles, California 90024). *Physical Review Letters;* **55**: No. 4, 359-362(22 Jul 1985).

The analyzing power, A/sub N/, has been measured for π^+p elastic scattering at p/sub π/ = 471, 547, 625, and 687 MeV/c on a transversely polarized target. The results are compared with three recent partial-wave analyses for the isospin (3/2) channel. The agreement with our data for all three analyses is good at 471 MeV/c and reasonable at 547 and 625 MeV/c. At 687 MeV/c two of the analyses show a sharp maximum near cosθ = -0.4 which is not seen in the data. There is no indication in our data of the existence of new, narrow Δ resonances.

40547 **Jet production and quark fragmentation results from PEP.** Hanson, G.G. (Stanford Linear Accelerator Center, CA (USA)). pp 147-151a of Proceedings of HEP83. International Europhysics conference on high energy physics, Brighton (UK), 20-27 July, 1983. Guy, J. (Rutherford Appleton Lab., Chilton (UK)); Costain, C. (eds.). Chilton, England; Rutherford Appleton Laboratory (1983). (CONF-830718—). Contract AC03-76SF00515.

From International Europhysics conference on high energy physics; Brighton, UK (20 Jul 1983).

Results on jet production and quark fragmentation are presented from the five detectors at the PEP e^+e^- storage ring at the Stanford Linear Accelerator Center. All data were taken at a center-of-mass energy (Esub(c.m.)) of 29 GeV. The topics which will be discussed are particle identification, charge and multiplicity correlations, energy correlation asymmetry, D* and D production and fragmentation, and heavy quark fragmentation results from inclusive lepton studies. PEP ran very well this year (1983) with 150 pb^{-1} delivered during the past running period. It will take the experiments some time to fully analyze this data.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 40507, 40523, 40523, 40534, 40610, 40610, 40610, 40622

40548 **(ANL/HEP-CP—85-32) Factorization of the Drell-Yan cross section.** Bodwin, G.T.; Brodsky, S.J.; Lepage, G.P. (Argonne National Lab., IL (USA); Stanford Linear Accelerator Center, CA (USA); Cornell Univ., Ithaca, NY (USA). Lab. of Nuclear Studies). Apr 1985. Contract W-31-109-ENG-38. 14p. (CONF-850375—14). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014978.

From 20. Recontre de Moriond; Les Arcs, France (10 Mar 1985).

We state the weak and strong factorization theorems for the Drell-Yan cross section and outline the ingredients involved in their proof. We also discuss the physical picture implied by the factorization results and its phenomenological consequences.

40549 (CEA-N—2406, pp 150-153) **Dilepton production from quark gluon plasma using non-equilibrium thermodynamics.** Sinha, B. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

The importance of the approach phase to the thermodynamic equilibrium has been investigated for dilepton production from quark-gluon plasma - an effective temperature for the quarks as Brounian particle in a heat bath of gluons has been suggested. The spectrum for low invariant mass is, as a consequence, sharper.

40550 (CERN—84-10-Vol.2, pp 393-453) **New particles and their experimental signatures.** Ellis, J.; Gelmini, G. (European Organization for Nuclear Research, Geneva (Switzerland)); Kowalski, H. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). 5 Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781156. (CONF-8403162—Vol.2).

From ECFA/CERN workshop on the possibility of a large hadron collider in the LEP tunnel; Lausanne, Switzerland (22 Mar 1984).

This report summarizes work done by our theoretical working group on exotic particles before, during and since the Lausanne meeting. We discuss the motivations, rates and experimental signatures for new physics and new particles in the 1 TeV mass range.

40551 (CERN—84-10-Vol.2, pp 457-468) **Why is this energy range so interesting.** Barbieri, R. (Pisa Univ. (Italy). Ist. di Fisica; Istituto Nazionale di Fisica Nucleare, Pisa (Italy)). 5 Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781156. (CONF-8403162—Vol.2).

From ECFA/CERN workshop on the possibility of a large hadron collider in the LEP tunnel; Lausanne, Switzerland (22 Mar 1984).

I briefly review the theoretical limits on the relevant physical scales in the various cases. I then make some remarks on possible high precision measurements. Finally I discuss the light fragments of the new particle spectra implied by the various theoretical options, as well as some suggestions to detect them.

40552 (CERN—84-10-Vol.2, pp 597-603) **Prospects of theoretical particle physics.** Hooft, G. 't (Rijksuniversiteit Utrecht (Netherlands). Inst. voor Theoretische Fysica). 5 Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781156. (CONF-8403162—Vol.2).

From ECFA/CERN workshop on the possibility of a large hadron collider in the LEP tunnel; Lausanne, Switzerland (22 Mar 1984).

At present, theorists have two options for resolving the naturalness problem beyond the 1000 GeV barrier. These are two competing theories: i) Supersymmetry. ii) Technicolour.

40553 (CERN—84-10-Vol.2, pp 549-569) **Physics of ep collisions in the TeV energy range.** Altarelli, G.; Mele, B.; Rueckl, R. (European Organization for Nuclear Research, Geneva (Switzerland)). 5 Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781156. (CONF-8403162—Vol.2).

From ECFA/CERN workshop on the possibility of a large hadron collider in the LEP tunnel; Lausanne, Switzerland (22 Mar 1984).

We study the physics of electron-proton collisions in the range of centre-of-mass energies between $\sqrt{s}$ approx.= 0.3 TeV (HERA) and $\sqrt{s}$ approx.= (1-2) TeV. The latter energies would be achieved if the electron or positron beam of LEP [E/sub e/ approx.= (50-100) GeV] is made to collide with the proton beam of LHC [E/sub p/ approx.= (5-10) TeV].

40554 (CERN—84-10-Vol.2, pp 469-530) **Hard hadronic collisions - extrapolation of standard effects.** Ali, A. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)); Aurenche, P.; Douiri, A. (Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules); Baier, R. (Bielefeld Univ. (Germany, F.R.)); Berger, E. (Argonne National Lab., IL (USA)); Fontannaz, M. (Paris-11 Univ., 91 - Orsay (France). Lab. de Physique Theorique et Hautes Energies); Humpert, B. (Lausanne Univ. (Switzerland)); Kinnunen, R. (Helsinki Univ. (Finland)); Pietarinen, E. (Helsinki Univ. (Finland)); Schiff, D. (Paris-11 Univ., 91 - Orsay (France). Lab. de Physique Theorique et Hautes Energies). 5 Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781156. (CONF-8403162—Vol.2).

From ECFA/CERN workshop on the possibility of a large hadron collider in the LEP tunnel; Lausanne, Switzerland (22 Mar 1984).

We study hard hadronic collisions for the proton-proton (pp) and the proton-antiproton (p anti p) option in the CERN LEP tunnel. Based on our current knowledge of hard collisions at the present CERN p anti p Collider, and with the help of quantum chromodynamics (QCD), we extrapolate to the next generation of hadron colliders with a centre-of-mass energy E/sub cm/ = 10-20 TeV. We estimate various signatures, trigger rates, event topologies, and associated distributions for a variety of old and new physical processes, involving prompt photons, leptons, jets, W^{+-} and Z bosons in the final state. We also calculate the maximum fermion and boson masses accessible at the LEP Hadron Collider. The standard QCD and electroweak processes studied here, being the main body of standard hard collisions, quantify the challenge of extracting new physics with hadron colliders. We hope that our estimates will provide a useful profile of the final states, and that our experimental physics colleagues will find this of use in the design of their detectors.

40555 (CERN—84-10-Vol.2, pp 531-542) **Soft physics with a supercollider.** Andersson, B. (Lund Univ. (Sweden). Dept. of Theoretical Physics). 5 Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781156. (CONF-8403162—Vol.2).

From ECFA/CERN workshop on the possibility of a large hadron collider in the LEP tunnel; Lausanne, Switzerland (22 Mar 1984).

I discuss a set of possible, more or less adventurous, physics scenarios for the soft physics of a supercollider of 10-20 TeV cms energy. I also present extrapolations of the sizes of different quantities to these immense energies. One should always note that whether we like it or not, some 95-99% of the cross-section is soft physics at all energies.

40556 (CERN—84-10-Vol.2, pp 543-548) **Heavy vector bosons and super colliders.** Llewellyn Smith, C.H.; Wheater, J.F.; Phillips, R.J.N. (Oxford Univ., England). 5 Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE85781156. (CONF-8403162—Vol.2).

From ECFA/CERN workshop on the possibility of a large hadron collider in the LEP tunnel; Lausanne, Switzerland (22 Mar 1984).

We concentrate on the extra bosons predicted by left-right symmetric models, in which parity - and also charge conjugation, in some versions - is spontaneously broken.

40557 (CONF-8406198—45) **Intrinsic Chevrolets at the SSC.** Brodsky, S.J.; Collins, J.C.; Ellis, S.D.; Gunion, J.F.; Mueller, A.H. (Stanford Linear Accelerator Center, CA (USA); Illinois Inst. of Tech., Chicago (USA). Dept. of Physics; Argonne National Lab., IL (USA); Washington Univ., Seattle (USA). Dept. of Physics; California Univ., Davis (USA). Dept. of Physics; Columbia Univ., New York (USA). Dept. of Physics). 1984. Contract W-31-109-ENG-38. 4p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85013896.

From Design and utilization of the superconducting super collider summer study; Snowmass, CO, USA (23 Jun 1984).

The possibility of the production at high energy of heavy quarks, supersymmetric particles and other large mass colored systems via the intrinsic twist-six components in the proton wave function is discussed. While the existing data do not rule out the possible relevance of intrinsic charm production at present energies, the extrapolation of such intrinsic contributions to very high masses and energies suggests that they will not play an important role at the SSC.

40558 (CRN-HE—84-10) **New weak boson decays and possible spin 3/2 leptons.** Fleury, N.; Leite Lopes, J.; Martins Simoes, J.A. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires). 1984. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85751926.

In this note we discuss the possibility that new spin 3/2 leptons can occur in nature as a manisfestation of leptonic structure and in multiplets in supersymmetric theories. We postulate a new interaction between spin 1/2 and spin 3/2 particles that maintains the standard SU(2)sub(L) x U(1) local gauge invariance. A comparison with the anomalous $Z^0 \rightarrow e^+ e^- \gamma$ events is made and new decays for the weak bosons are studied.

40559 (DESY—85-006) **New particles and two-photon physics.** Schrempp, F. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Jan 1985. 32p. (CONF-8409194—6). NTIS (US Sales Only), PC A03/MF A01. File Number DE85752007.

From 6. international workshop on photon-photon collisions; Lake Tahoe, CA, USA (9 Sep 1984).

In a first part, I review the general theoretical arguments leading to new physics and new particles beyond the Standard Model, either in terms of supersymmetry or compositeness. Speculations about new particles expected within these schemes are then discussed in the light of recent anomalous events from the panti p collider and from PETRA. In a second part, I specifically try to evaluate the potential of $\gamma\gamma$ and epsilonγ collisions at PETRA/PEP and LEP energies with respect to new particle searches. Some interesting possibilities, including searches for spinless composite bosons, non-standard enhanced Higgs particles, scalar electrons (e) and $\gamma\gamma$ ->'nothing' emerge.

40560 (DESY—85-008) **Confinement criterion for QCD with dynamical quarks.** Fredenhagen, K.; Marcu, M. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Jan 1985. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85752009.

We propose a criterion that tests the existence of isolated quarks in QCD.

40561 (DESY—85-015) **Monopole-fermion and dyon-fermion bound states. Pt. 5.** Osland, P.; Schultz, C.L.; Wu, T.T. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Feb 1985. Contract FG02-84ER40158. 66p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85752015.

We present explicit, approximate, remarkably precise results for the Kazama-Yang Hamiltonian, which describes a Dirac monopole interacting with a spin-1/2 fermion that has an extra magnetic moment. The results are valid for bound states of angular momentum j > = Zvertical strokeegvertical stroke+1/2, where the radial wave functions are determined by four coupled differential equations. These equations have been solved analytically for M - E << M, which is a limit of considerable practical interest. Binding energies and wave functions are given.

40562 (DOE/ER/03992—576) **Quantum relativistic oscillator II. Non-relativistic limit and phenomenological justification.** Bohm, A.; Loewe, M.; Magnollay, P. (Texas Univ., Austin (USA). Center for Particle Theory). Dec 1984. Contract AS05-76ER03992. 22p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014731.

It is shown that the quantum relativistic oscillator with noncommuting internal momentum and position has as the non-relativistic contraction limit the usual three-dimensional oscillator. The non-relativistic limits for representations with integer and half integer spin are compared with the quark model picture. The spectrum predicted by the quantum relativistic oscillator with rotations is compared with experimental hadron spectra. 14 refs., 7 figs.

40563 (DOE/ER/03992—577) **Dirac neutrinos in GUTs.** Sarkar, U. (Texas Univ., Austin (USA). Center for Particle Theory). Jan 1985. Contract AS05-76ER03992. 10p. (CONF-8410224—9). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014730.

From AIP conference on neutrino mass and gauge structure of weak interaction; Cable, WI, USA (24 Oct 1984).

Some of the recent experimental results can be explained by considering the electron neutrino to be a Dirac particle. In the present article, the possible grand unified theories of generating such ultralight Dirac neutrinos in a natural way are reviewed. 19 refs.

40564 (DOE/ER/04999—T3) **Research in high energy physics (particles and fields and their interactions). Technical progress report, September 1, 1978-July 30, 1979.** Yildiz, A. (New Hampshire Univ., Durham (USA). Coll. of Engineering and Physical Sciences). 1979. Contract AC01-78ER04999. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85013511.

The research activities reported relate to the following areas: search for Higgs and gauge bosons, proton decay, theoretical investigations on unified theories, the neutron's electric dipole moment, and vacuum behavior in quantum chromodynamics. (LEW)

40565 (DOE/ER/04999—T4) **Research in particles and fields and their interactions. Technical progress report, November 1981-December 1982.** Yildiz, A. (New Hampshire Univ., Durham (USA). Coll. of Engineering and Physical Sciences). 1982. Contract AC01-78ER04999. 20p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85013512.

The research reported included: investigation of Grand Unification Theories, calculation of the electric dipole moment of the neutron, and work in cosmology-particle physics. A few areas still under investigation include extended supersymmetry, finite temperature field theories, inflationary universe scenarios, heavy ion colli-

sion physics, and hypercolor unification without domain walls. 9 refs. (LEW)

40566 **(DOE/ER/40025—34) Comments about the electroweak asymmetry in $e^+e^- \rightarrow f$ anti f.** Ford, W.T. (Colorado Univ., Boulder (USA)). May 1985. Contract AC02-81ER40025. 6p. (MAC—730). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014899.

Some questions are considered regarding the proper treatment of weak radiative corrections in the $e^+e^- \rightarrow f$ anti f asymmetry measurement (where f is a charged bermion other than e) and what is the best way to use the data to test the standard model. (LEW)

40567 **(DOE/ER/40169—1) Parton dynamics in hadronic processes. Technical progress report.** Sukhatme, U.P. (Illinois Univ., Chicago (USA). Dept. of Physics). Feb 1985. Contract FG02-84ER40169. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014271.

We have studied the production of strangeness, charm and other heavy flavors in hadronic collisions in the framework of the dual parton model. This model allows us to understand why heavy flavors have "delayed thresholds" and noticeable production at large x values. We have also studied the leading particle effect in a variety of processes. We suggest the intriguing possibility that certain experimentally feasible non-diffractive processes involving soft gluons might have forward "diffraction-like" peak as $x \rightarrow 1$. Finally, we have extended the techniques previously developed by us to get accurate analytic expressions for energy eigenstates. This enables us to get much-improved expansions for bound state wave functions, which compare remarkably well with numerical computations. 9 refs.

40568 **(IFVE-OEF—84-14) New test of non-Abelian nature of QCD.** Zmushko, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701773.

The sign of the interference term $\Delta(d\sigma/dt)$ of the quark-quark scattering cross section is shown to be connected with the non-Abelian nature of the QCD. It is proposed to measure the sign of the difference of the inclusive cross sections for π^0 production in pp and np collisions with large psub(T), which is defined by $\Delta(d\sigma/dt)$ sign. The predictions for the effect value are presented. 8 references, 3 figures.

40569 **(IFVE-ONF—84-84) Possibility of detection of heavy neutrino decays.** Baranov, D.S.; Vovenko, A.S.; Spiridonov, A.A.; Tikhonin, F.F. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701770.

A possibility to detect decays of heavy neutrinos that might be produced from pion and kaon decays are examined. Different decay modes of heavy Dirac neutrino were considered. Estimations show that if one uses a special configuration of the neutrino detector in searching for decays in the wide-spectrum neutrino beam of the IHEP accelerator then a considerable improvement of the limits on the neutrino mixing parameters in the 10-490 MeV mass range may be achieved. 27 references, 7 figures, 3 tables.

40570 **(IFVE-OTF—84-30) Relation between high-energy and low-energy parameters of $\pi\pi$ interaction.** Parfenov, Yu.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701774.

A low energy model of partial amplitudes for $\pi\pi$ scattering which agrees well with the available low-energy information, has been proposed. On the basis of this model the behaviour of total cross sections for $\pi\pi$ scattering is considered in the asymptotic domain for simple and double pomeron, the last arising as an intersection of the trajectories of two simple poles. 13 references, 4 figures, 1 table.

40571 **(IFVE-OTF—84-37) Cross section growth of hadron-hadron interactions and its possible connection with glueball existence.** Gershtejn, S.S.; Logunov, A.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701775.

A hypothesis on the connection of hadron interaction cross sections growth and the resonance production of glueballs from two sea gluons is proposed. This mechanism may explain the appearance of a large scale factor S_0 approximately GeV^2 in the growing part of the cross section. 9 references, 1 figure.

40572 (INIS-mf—9311, pp 197-208) **Summary talk on electroweak interactions and neutrino physics.** Scheck, F. (Mainz Univ. (Germany, F.R.). Inst. fuer Physik). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

There are two different approaches to particle physics at intermediate energies (where 'intermediate' more precisely refers to the mass and energy range up to, say, the W and Z^0 masses), through which this branch is and will prove to be complementary to research at higher energies: (A) Precision experiments to test the validity and limitations of our present understanding of strong and electroweak interactions and its theoretical framework. In some of the following discussion we shall call this the 'Lamb shift approach'. (B) Searches for new phenomena that would require, if they are confirmed, major revision of the present ideas and reference theories, as well as investigations in those areas where these theories are unable to make affirmative predictions. The frame of reference to which the discussions and investigations refer is what we presently call the standard model of strong, electromagnetic and weak interactions.

40573 (INIS-mf—9311, pp 367-402) **Electromagnetic probing of hadron structure and nuclear constituents.** Drees, J. (Wuppertal Univ. (Gesamthochschule) (Germany, F.R.)). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984). Summary of discussion.

The topics presented in the working group centered around particle and nuclear physics prospects for future electron accelerators in the few GeV region and for muon beams with 100-300 GeV beam energy. This included a comparison of the possibilities of a muon beam feasible at a 20-30 GeV proton machine versus an electron beam. I concentrate on those areas where our understanding of nucleon and nuclear structure is still weak and where important pieces of experimental information are missing.

40574 (INIS-mf—9311, pp 137-150) **Radiative weak decays.** Schilcher, K. (Mainz Univ. (Germany, F.R.). Inst. fuer Physik). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

To every weak decay there exists a radiative pendant where an additional real photon is emitted. Since QED is a well-established theory, it may seem that not much can be learned from a study, experimentally or theoretically, of radiative decays. Quite the opposite is true, however, for these decays open exciting new windows to look at the weak interactions of hadrons. For instance, in radiative pion decay both vector and axial currents contribute nontrivially.

40575 (INIS-mf—9311, pp 3-51) **Weak interactions of hadrons.** Rueckl, R. (European Organization for Nuclear Research, Geneva (Switzerland)). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

A summary is presented of the topics discussed in the study group on 'Weak Interactions of Hadrons'.

40576 (INIS-mf—9311, pp 151-170) **Low-energy weak interactions of hadrons in the standard model.** Schmid, C. (Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. fuer Theoretische Physik). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

Weak interactions at the quark-lepton level are concisely and successfully described by the Glashow-Weinberg-Salam-GIM-KM model. The strong interaction effects involving large Psub(t) (hard gluon corrections) can be computed by perturbative QCD, while the difficult task has to do with nonperturbative QCD effects: How can we make predictions at the hadron level.

40577 (INIS-mf—9311, pp 261-284) **Physics with protons, pions, antiprotons.** Koch, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.); Karlsruhe Univ. (T.H.) (Germany, F.R.)). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

Summary of discussion.

The background of the discussions within this session was the question of what interesting physics could be done if π, p, K, anti p, anti n-beams of good quality and high intensities were available in an energy region up to 30 GeV for primary and up to 15 GeV for secondary particles. I have picked up three main topics which will be discussed in Section 2:* Where is the region of Asymptotica; spectroscopy of quarks with different flavors; low energy phenomena. In Section 3 it is tried to summarize all requests to the particle beams which would satisfy the potential users of such a high intensity facility as far as hadronic aspects are concerned. From these requests conclusions will be drawn in respect to the parameters of the machine feeding the beams. In Section 4, the highlights of the discussions are summarized and conclusions are drawn.

40578 (INIS-mf—9311, pp 285-287) **Charm, bottom and Higgs search.** Dalpiaz, P. (Ferrara Univ. (Italy). Ist. di Fisica; Istituto Nazionale di Fisica Nucleare, Bologna (Italy)). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

Published in summary form only.

40579 (INIS-mf—9311, pp 289-316) **Physics interest in wide angle scattering of hadrons at medium energies.** Kroll, P. (Wuppertal Univ. (Gesamthochschule) (Germany, F.R.). Fachbereich 8 - Naturwissenschaften 1 - Physik). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

The physics interest in exclusive and inclusive hadronic reactions at wide angles and medium energies is discussed. The importance of the study of spin effects is stressed. These are very sensitive to the underlying dynamics and allow severe tests of any model. The hard scattering picture for exclusive and inclusive reactions is examined in some detail as well as a few alternatives which might be more appropriate for semihard reactions.

40580 (INIS-mf—9311, pp 317-336) **anti pp physics above 2GeV/c.** Litchfield, P.J. (Science and Engineering Research Council, Chilton (UK). Rutherford Appleton Lab.). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

Also presented at the LAMPF II workshop, July 1983.

I present some of the physics that can be done with the intense anti p beams that would be available from a high intensity, 30 GeV, rapid cycling proton synchrotron. Physics below 2 GeV/c will be extensively studied at the LEAR facility at CERN and I thus restrict myself to beam momenta above this value. I specify the requirements for beams and detectors to enable a program of anti pp physics to be done.

40581 (INIS-mf—9311, pp 339-354) **Summary of the working group "strong interactions with strange particles".** Walcher, T. (Max-Planck-Institut fuer Kernphysik, Heidelberg (Germany, F.R.)). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

The talks and discussions of the working group on 'Strong Interactions with Strange Particles' are summarized. Three main topics are covered: 1) Strange Baryons and Dibaryons, 2) Scattering of Strange Baryons and Mesons, and 3) Hypernuclei. The idea of strong interactions with strange hadrons as a means to study quark dynamics in the low q^2 regime is emphasized.

40582 (INIS-mf—9311, pp 53-117) **CP violation in the standard model and beyond.** Buras, A.J. (Max-Planck-Institut fuer Physik und Astrophysik, Muenchen (Germany, F.R.). Werner-Heisenberg-Inst. fuer Physik). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

The present status of CP violation in the standard six quark model is reviewed and a combined analysis with B-meson decays is presented. The theoretical uncertainties in the analysis are discussed and the resulting KM weak mixing angles, the phase delta and the ratio epsilon'/epsilon are given as functions of Tsub(B), GAMMA(b -> u)/GAMMA(b -> c), msub(t) and the B parameter. For certain ranges of the values of these parameters the standard model is not capable in reproducing the experimental values for the epsilon' and epsilon parameters. Anticipating possible difficulties we discuss various alternatives to the standard explanation of CP violation such as horizontal interactions, left-right symmetric models and supersymmetry. CP violation outside the kaon system is also briefly discussed.

40583 **(INIS-mf—9572) Mass spectrum of particles.** Sajo, I. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). 1983. 101p. (In Hungarian). NTIS (US Sales Only), PC A06/MF A01. File Number DE85781268.

An eigenvalue formula of general validity was developed with correct mathematical methods from measured data of the stationary mass and self-energy of stationary particles; this is able to generate universally the mass of particles belonging to any class or group, i.e. to produce the spectra of particles with a stationary mass surpassing that of the electron. The author shows that this eigenvalue formula can be produced as the product of several partial formulae which, separately, are not more complicated than that developed by Balmer from data measured on the spectrum of the hydrogen atom. The validity of the first version of the formulae was checked for many particles discovered subsequently. The results are published in detail in the present paper, together with the method of development of the universal eigenvalue formula generating the mass spectrum of elementary particles. The formulae describing the discrete energy levels of the particles can be extended by considering the theory of special relativity, also to the mass of moving particles. 14 references, 6 figures, 12 tables.

40584 **(INIS-mf—9690) Calculation of energy levels in a system of two magnetic monopoles by semiclassic theory.** Barricelli, N.A. (Oslo Univ. (Norway). Matematisk Inst.). 1982. 3p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781269.

This paper presents evidence that in a system of two magnetic monopoles the energy levels can easily be calculated by semiclassical methods, in spite of their large magnetic charges, provided one pays attention to the fact that the lowest orbits in such systems are far inside the classical radius distance range. At this range the

magnetic fields are far weaker than their coulombian values according to classic and semiclassic theory, because as one approaches the center a growing portion of the charge remains outside and does not contribute to the local magnetic field. The very strong short range coulombian fields which have frustrated all earlier attempts to calculate energy levels in a system of two magnetic monopoles do not and cannot materialize in semiclassic theory. Examples of calculated orbits and energy levels are presented.

40585 **(INIS-mf—9691) Masses of elementary particles. Application of semi-classical energy levels in magnetic monopole systems.** Barricelli, N.A. (Oslo Univ. (Norway). Matematisk Inst.). 1983. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781270.

The semi-classical method of calculating the energy levels in a system of two magnetic monopoles, presented in a preceding paper, is applied in the interpretation of the masses and angular momenta of various elementary particles. The interpretation involves new proposals concerning the organization of magnetic monopoles (configurations) in various elementary particles. It is worth noticing that no other theory known today has been capable of calculating the masses of so many elementary particles by using so few free parameters (meaning parameters neither expressed in terms of universal constants nor calculated by the theory) and with a precision comparable to that obtained in the model presented here.

40586 **(INIS-mf—9692) Conservation of basic monopoles in decay processes.** Barricelli, N.A. (Oslo Univ. (Norway). Matematisk Inst.). 1983. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781271.

The conversation law of basic monpoles and other rules followed by these monopoles in the formation and decay processes of elementary particles are presented and discussed. A new interpretation of the distinction between rapid decay process (commonly ascribed to weak interactions) is proposed.

40587 (INIS-SU—289, pp 3-7) **Basic problems of high energy physics.** Arbuzov, B.A. (Inst. Fiziki Vysokikh Ehnergij, Serpukhov, USSR). 1983. (In Russian). NTIS (US Sales Only), PC A17/MF A01. File Number DE85781267. (CONF-8210133—Vol.1).

From 8. All-Union conference on the charged particle accelerators; Protvino, USSR (19 Oct 1982).

The basic problems of high energy physics are considered. The important problem of strong interactions is to find out the nature of forces between quarks. In the superhigh energy range in collisions of particles and nuclei production of quark-gluon plasma is predicted. The studies of plasma parameters will allow to find out the details of quark and gluon interactions. In the range of weak and electromagnetic interactions the importance of detection of W- and Z-bosons, Higgs bosons and search for neutrino oscillations is shown. It is also shown that further development of the superunification theory and investigations of the quark and lepton structure is of great importance. 1 figure.

40588 **(ITEP—41(1984)) Distributions of valence quarks in hadrons at small x in QCD.** Ioffe, B.L.; Kaidalov, A.B. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1984. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701776.

Valence u- and d-quark distributions in nucleon and pion at small x ($x = -q^2/2nu$ is the fraction of the momentum carried by quarks) corresponding to rho and ω Regge pole exchange have been obtained on the basis of the QCD sum rule method. 6 references, 3 figures.

40589 **(ITF—84-94-R) Effect of hadrons multiple production on the thermodynamics of matter at ultrarelativistic temperatures.** Bugrij, A.I.; Trushevskij, A.A.; Shadura, V.N. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1984. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701777.

A representation for the equation of state of hadronic matter at ultrarelativistic temperatures is obtained in terms of multiplicity distribution function. The character of the equation of state is shown to be determined by the energy dependence of topological cross-sections σsub(n)(E) at n approximately equal to E. 9 references, 2 figures.

40590 **(ITP—83-128-E) Local anisotropy effects in the hydrodynamical theory of multiparticle production.** Gorenshtejn, M.I.; Sinyukov, Yu.M. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1983. 21p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701778.

The stage of final particle formation in the hydrodynamic theory of multiparticle production is analysed. It is shown, that secondary particle spectrum of the fluid element decay to be anisotropic in the rest frame system of this element. 10 references, 2 figures.

40591 **(JINR—2-84-426) Production of meson pairs with large transverse momenta in hadron-nuclear interactions.** Dolidze, M.G.; Lykasov, G.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701784.

The dependence of spectra of symmetric meson pairs produced in h-A reactions on atomic number of a target-nucleus A in the quark model is analysed. It is shown that the A-dependence of meson pair Psub(perpendicular)-spectra is weaker than in the case of a single meson production due to suppression of the contribution of multiple quark collisions (Psub(perpindicular) is the meson transverse momentum). The comparison of theoretical calculations with experimental data at $E_0 = 70$ GeV and Psub(perpendicular) $>= 0.5$ GeV/c is given. 16 references, 3 figures.

40592 **(JINR—R-2-83-842) QCD sum rules of the finite energy type.** Ivanov, Yu.P.; Kovalenko, S.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1983. 3p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701779.

Sum rules of the finite-energy type are discussed in the framework of quantum chromodynamics. It is shown that the sum rules can be obtained in the frame work of quantum chromodynamics for structure functions of deep inelastic scattering in the main logarithmic approximation of perturbation theory of quantum chromodynamics. 3 references.

40593 **(JINR—R-2-84-10) Description of π meson structure functions in a relativistic theory of bound states.** Kryuchkov, S.V.; Linkevich, A.D.; Savrin, V.I.; Sanadze, V.V.; Skachkov, N.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701780.

In the framework of covariant Hamiltonian formulation of quantum field theory the formulae for structure functions of deep inelastic lepton scattering on π-mesons are obtained. It is considered as the bound state of spinor quark and antiquark. scaling properties of structure functions are investigated, and comparison with experimental data is performed. It is shown that the character of scale violation is determined by wave functions of the bound state. 11 references, 4 figures.

40594 **(JINR—R-2-84-64) Analysis of experimental semi-inclusive distributions at the SPS collider energies.** Darbaidze, Ya.Z.; Sisakyan, A.N.; Slepchenko, L.A.; Torosyan, G.T. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701782.

From 22. International conference on high energy physics; Leipzig, German Democratic Republic (19-25 Jul 1984).

The experimental data on hadron-hadron interactions at up to sps collider energies are analyzed carefully within a multi-component (anti pp, pp,K^+ $^-$p, and π^{+-}r reactions) approach based on the renormalization group method. The approach gives the possibility of description of experimental regularities. In particular, the behaviour of total cross sections and forward-backward correlations of scattered particles is desribed as well as the broadening of

psub(t)-spectra with increasing multiplicity of charged particles and the sea-gull effect for eta-distributions observed at small multiplicities. 26 references, 6 figures.

40595 **(JINR—R-2-84-412) $Q_1 \rightarrow K(p,\omega)$ decays of Q_3-meson.** Volkov, M.K.; Khodzhaeva, Z.L. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 3p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701781.

The strong decays Qsub(1)→Ksub(rho) and Qsub(1)→Ksub(ω) are calculated in the quark model of the superconductivity type. 8 references, 1 figure.

40596 **(JINR—R-4-83-560) Annihilation of antiprotons in deuterium with emission of single pions and in helium with emission of two pions.** Nikitiu, F.; Piradzhino, G.; Falomkin, I.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1983. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701783.

A simple model is proposed for the description of reactions involving the emission of single pion in anti pd-annihilation, and the emission of two negative pions in anti p^4He-annihilation. In the model account is taken of the connection between the above processes and the respective cross-symmetric reactions: pion absorption by deuterium and double charge exchange of a pion on the helium nucleus. Parallel investigation of the mentioned direct and cross-symmetric reactions is important for the understanding of particle absorption by correlated nucleons. 9 references, 5 figures, 1 table.

40597 **(KMU-HEP—84-05) Parton jet fragmentation at small momentum fraction (x).** Kirschner, R. (Karl-Marx-Universitaet, Leipzig (German Democratic Republic). Sektion Physik). May 1984. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701785.

The parton fragmentation function is calculated at small x and the angular ordering condition is rederived by extending the method of separation of the softest particle, which is based on unitarity and gauge invariance.

40598 **(OUP—84-12) Semileptonic *DELTA*S=1 decays of baryons with boosted bags.** Eeg, J.O.; Lie-Svendsen, Oe. (Oslo Univ. (Norway). Fysisk Inst.). Mar 1984. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781045.

Recoil effects for strangeness-changing semileptonic decays of baryons by means of boosted quark mode solutions of the MIT bag model is calculated. Both the quark and the psevdoscalar part of the axial current is considered. It is shown that the induced scalar form factor f*sb3* and the "weak electric" form factor g*sb2* are proportional to the mass difference of the final and initial baryon. Moreover, it is shown that the quark wave function mismatch, which decreases the conventional vector form factor f*sb1*, can be compensated by recoil effects. Thus a better agreement with experiment seems to be achieved.

40599 **(PUC-TN—05/82) Quark model with one-gluon corrections-radially excited states.** Amaral, M.G. do; Zagury, N. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1982. 31p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781048.

Under the assumption that quarks are confined, in a first approximation, by a relativistic potencial $U(r) = 1/2(1+\beta)V(r)$, and taking in consideration one-gluon corrections, the mass spectrum for the first radially excited positive parity baryons is calculated.

40600 **(RAL—84-088) Electroweak interactions and new particle searches.** Marshall, R. (Rutherford Appleton Lab., Chilton (UK)). Aug 1984. 10p. (CONF-8408138—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781047.

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Electroweak interactions are reviewed, from the time the neutrino first emerged to present day searches for new particles. In investigations of the electroweak interaction, the formation of "fermion-anti fermion" pair in e^+e^- accelerators is discussed, as well as a comparison of data with theory for leptons, quarks and flavours. A summary of electroweak analyses is given.

40601 **(RAL—84-094) Electroweak interference in e^+e^- annihilation.** Saxon, D.H. (Rutherford Appleton Lab., Chilton (UK)). Oct 1984. 21p. (CONF-8408141—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701772.

From 4. international conference on physics in collision; Santa Cruz, CA, USA (22 Aug 1984).

High precision results from PEP and the extended energy range of PETRA now allow accurate comparison of experimental results with theory. One-loop weak corrections have been calculated in both Weinberg-Salam and Glashow schemes and are needed in these comparisons. The Zsup(o) propagator effect is seen and the asymmetries agree, with a 7% error, with rho = 1. The μ-pair asymmetry is a little high. The effects of normalisation errors are discussed. The weak isospins of c- and b-quarks have been measured and are consistent with weak isodoublets, so that a t-quark is required by the asymmetry measurements.

40602 **(RAL—84-102) Supersymmetric models without R parity.** Ross, G.G.; Valle, J.W.F. (Rutherford Appleton Lab., Chilton (UK)). Nov 1984. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781049.

The authors show that many supersymmetric models may spontaneously break R parity through scalar neutrinos acquiring a vacuum expectation value (vev). These models allow supersymmetric particles to be produced singly and to decay to nonsupersymmetric states. This leads to a new pattern of supersymmetric phenomenology. The lepton number violation to be expected in this class of models is discussed.

40603 **Bound states of heavy Q^2Q^2 systems.** Heller, L.; Tjon, J.A. (Theoretical Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review [Section] D: Particles and Fields;* **32**: No. 3, 755-763(1 Aug 1985).

The Born-Oppenheimer approximation for heavy quarks in the MIT bag is extended to the Q^2Q^2 system, where the glue plus volume energy becomes an operator in color space. Taking its lowest eigenvalue as the approximate potential energy, the four-body Schroedinger equation is solved variationally for the ground-state energy. With this approximation, it is found that heavy-quark systems such as c^2c-bar^2 are stable against breakup into two psi (cc-bar) mesons. It is necessary to solve the coupled-channel (in color space) problem to confirm this result.

40604 **Cyclotron motion in a microwave cavity: Possible shifts of the measured electron g factor.** Brown, L.S.; Gabrielse, G.; Helmerson, K.; Tan, J. (Department of Physics, FM-15, University of Washington, Seattle, Washington 98195). *Physical Review Letters;* **55**: No. 1, 44-47(1 Jul 1985). Contract AC06-81ER40048.

The interaction of a bound electron with the radiation field produced by the image charges that represent a surrounding cavity produces a shift in its orbital frequency and in its radiative decay time. We calculate the frequency shift and the change in the damping constant for a cyclotron motion at the midpoint of a lossy, cylindrical cavity. The frequency shift can easily be so large as to have important consequences for the University of Washington g-2 measurements.

40605 **Light quark spectroscopy.** Aston, D. (Stanford Linear Accelerator Center, CA (USA)). pp 343-347A of Proceedings of HEP83. International Europhysics conference on high energy physics, Brighton (UK), 20-27 July, 1983. Guy, J. (Rutherford Appleton Lab., Chilton (UK)); Costain, C. (eds.). Chilton, England; Rutherford Appleton Laboratory (1983). (CONF-830718—). Contract AC03-76SF00515.

From International Europhysics conference on high energy physics; Brighton, UK (20 Jul 1983).

The paper reviews light quark spectroscopy and the meson spectrum. Electromagnetic properties and leading resonances are described. The discussion of orbital and radial excitations includes:

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scalar mesons; vector mesons in e^+e^- and photoproduction; and the three-body partial wave analyses.

40606 **Hadronic production of glueballs.** Lindenbaum, S.J. (Brookhaven National Lab., Upton, NY (USA); City Coll., New York (USA)). pp 351-360 of Proceedings of HEP83. International Europhysics conference on high energy physics, Brighton (UK), 20-27 July, 1983. Guy, J. (Rutherford Appleton Lab., Chilton (UK)); Costain, C. (eds.). Chilton, England; Rutherford Appleton Laboratory (1983). (CONF-830718—).

From International Europhysics conference on high energy physics; Brighton, UK (20 Jul 1983).

The paper reviews hadronic production of glueballs and searches for glueballs. Glueball production; glueballs produced in the reaction $\pi^- p \rightarrow$phiphin; search for narrow enhancements in phiphi system; and double pomeron exchange and other central region glueball searches; are all discussed.

6453 Particle Invariance Principles And Symmetries

REFER ALSO TO CITATION(S) 40565, 40614, 40942, 40952

40607 **(RAL—84-085) Phenomenology of supersymmetry with broken R-parity.** Ellis, J.; Gelmini, G.; Jarlskog, C.; Ross, G.G.; Valle, J.W.F. (Rutherford Appleton Lab., Chilton (UK)). Sep 1984. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701701.

In some phenomenological supersymmetric models R-parity (+1 for particles, -1 for sparticles) is spontaneously broken along with tau lepton number L/sub tau/ by a vacuum expectation value v/sub tau/ of the tau sneutrino ν/sub tau/. In this paper the authors explore the phenomenological constraints on models with spontaneous violation of R-parity and L/sub tau/, and propose some experimental signatures.

40608 **Signals of CP nonconservation in hyperon decay.** Donoghue, J.F.; Pakvasa, S. (Department of Physics, University of Massachusetts, Amherst, Massachusetts 01002). *Physical Review Letters;* **55**: No. 2, 162-165(8 Jul 1985). Contract AM03-76SF00235.

We survey the CP-odd asymmetries which can signal CP nonconservation in hyperon decay. The optimal measurement involves the β parameter in the decay distribution, i.e., (β+beta-bar)/(β-beta-bar), which can be quite large in some models. Explicit calculations are provided for all the observables for several theories of CP nonconservation.

6454 Field Theory

REFER ALSO TO CITATION(S) 40404, 40560, 40563, 40565, 40592, 40603

40609 **(CTA-IEAV-RP—010/83) Response of a Higgs kink to a static external force.** Geicke, J. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Estudos Avancados). Oct 1983. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701694.

The acceleration of a phi 4 - kink in a weak constant external field /chi/ << 1 is studied analytically and numerically. Similarly as for a sine-Gordon Kink a non - Newtonian acceleration v/sub ./ (t) approx. /chi/ t^3 is observed for $t << T = \sqrt{2\pi}$. However, for very weak fields /chi/ << 1/T the acceleration in the time average over a full period T is Newtonian.

40610 **(DESY—84-123) Tests and present status of gauge theories.** Peccei, R.D. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Dec 1984. 112p. (CONF-8408160—Pt.1; MPI-PAE/PTH—76/84). NTIS (US Sales Only), PC A06/MF A01. File Number DE85752006.

From NATO Advanced Study Institute on techniques and concepts of high energy physics; St. Croix, VI, USA (2 Aug 1984).

In these lectures the predictions are discussed for the, so called, standard model for the strong, weak and electromagnetic interactions. A set of exercises is included for understanding the material covered.

40611 **(DESY—85-009) More about the SU(2) 2^+ glueball state.** Kamenzki, H.; Berg, B. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Jan 1985. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85752010.

Within 4d SU(2) lattice gauge theory the 2^+ glueball is investigated. Using a recently proposed source we carry out a high statistics Monte Carlo calculation at β=2.25 and β=2.40. We obtain correlations up to distance t=3. For increasing distances we find a significantly decreasing m(2^+) mass.

40612 **(DESY—85-010) Have color octet vector bosons been found.** Cornet, F. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Feb 1985. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85752018.

We study the interpretation of the CERN monojet and e jet + missing energy events in terms of a new triplet of color octet vector bosons, W vector$_8$. We show that they should also appear in photon-jet final states that will provide a clear signature on the existence of the W vector.

40613 **(DESY—85-013) Nonperturbative renormalization of quantum gauge theories.** Kerler, W. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Feb 1985. 56p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85752014.

A systematic nonperturbative formulation of quantum gauge theories is given, which defines the renormalized theory as an appropriate limit of a lattice-regularized one. First some features of the regularization in particular with respect to fermions and to gauge invariance are discussed. The conditions for the existence of the limit, which are those of general renormalizability, are worked out in detail. A fundamental parameter singularity and basic equivalence relations are important features. Mass scales and RG invariants are defined in a general way. Directly measurable quantities and order parameters are considered. Various types of β functions are studied. The present knowledge about fundamental singularities in specific theories and the urgent need to investigate ones with matter fields are discussed. The consequent manner of applying KW transformations to QFT and the occurring restrictions are pointed out. An additional condition arising for correlation functions and its implications for particular transformation types are considered. Using an appropriate auxiliary-parameter representation only long-distance properties of the action enter QFT and a characterization of its parameters becomes possible. The need of investigating suitable classes of KW transformations is stressed.

40614 **(DOE/ER/03130—371) Theoretical high-energy physics. Progress report, 1 January-31 December 1985.** Feldman, D.; Fried, H.M.; Jevicki, A.; Kang, K.; Tan, C.I. (Brown Univ., Providence, RI (USA). Dept. of Physics). 30 Jun 1985. Contract AC02-76ER03130. 17p. (BROWN/HET—560). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014446.

This year's research has dealt with: one-loop structure of spontaneously broken gauge theories and the contraction of symmetry groups; continuum strong coupling approximations by infrared extraction; methods of approximating ordered exponentials; field theoretic methods for viscous Navier-Stokes fluid flow; discretization method to quantum gravity and string field theory; skyrmions and solitons in field theory; nonlinear σ-models with Wess-Zumino type terms; a variety of grand unification models and family unification in grand unified theories; composite fermions; axions in superstring models; cosmological constraint on heavy particles; axion emissions in astrophysicial systems; calculability of flavor-mixings; a field theoretic understanding of the quantum Hall effect including scaling of effective θ-parameter for non-axionic explanation of strong CP invariance; correlation decay theorem at high temperature; axial anomaly in chirally invariant nonlocal lattice gauge theories; axial anomaly and index theorem for manifolds with boundary; nonperturbative aspect of lattice gauge theories; lattice QCD in

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large N limit; quantum fluctuations of matter fields; and pregeometric quantum lattice. 40 refs.

40615 **(EFI—614(4)-83) Summation of diagrams by means of Legendre transformation in scalar parameter. Higher orders.** Ananikyan, N.S.; Balayan, G.L. (Erevanskij Fizicheskij Inst. (USSR)). 1983. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701724.

Results of the investigation of higher orders of diagram summation method by means of the Legendre transformation in scalar parameter are presented. The investigations show a number of advantages of such summation as compared with the standard perturbation theory. 4 references, 1 figure, 1 table.

40616 **(EFI—641(31)-83) Homogeneous models of Yang-Mills classical fields with external sources.** Arutyunyan, S.G.; Avakyan, N.R.; Baseyan, N.Z. (Erevanskij Fizicheskij Inst. (USSR)). 1983. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701725.

Homogeneous models of Yang-Mills classical fields with external static sources are considered. Numerical experiments on a computer are performed with the aim to clarify the influence of external sources on the homogeneous models stochasticity. 11 references, 7 figures.

40617 **(EFI—642(32)-83) Stochastic mechanism of symmetry breaking.** Baseyan, H.Z. (Erevanskij Fizicheskij Inst. (USSR)). 1983. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701736.

A new symmetry breaking mechanism conditioned by presence of random fields in vacuum is proposed. Massive Yang-Mills fields finally arise, that may be interpreted as macroscopic manifestation of the microscopic Yang-Mills massless theory. 5 references.

40618 **(IFT-P—05/84) Lattice supersymmetry for N=4 Yang-Mills Model.** Aratyn, H.; Zimerman, A.H. (Instituto de Fisica Teorica, Sao Paulo (Brazil)). 1984. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701695.

A supersymmetric four-dimensional N = 4 Yang Mills Model on the space lattice is introduced. The construction involves Dirac-Kahler formalism. The Hamiltonian on the space lattice with the correct classical continuum limits is obtained.

40619 **(IFT-P—07/84) Infrared dimensional meromorphy of the massless lambda phi 4 model.** Malbouisson, A.P.C.; Camargo Filho, A.F. de; Pimentel, B.M. (Instituto de Fisica Teorica, Sao Paulo (Brazil)). 1984. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701696.

Some features of the infrared poles in space-time dimension of the Green functions for the Euclidean lambda phi 4 model are examined.

40620 **(IFT-P—08/84) Fractionization of the Witten index in some soluble models.** Alves, N.A.; Aratyn, H.; Zimerman, A.H. (Instituto de Fisica Teorica, Sao Paulo (Brazil)). 1984. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701697.

The technique of analytic regularization is used to study the Witten index in two conformally invariant super-symmetric quantum mechanical models. The role of the non-normalizable zero-mode states is discussed in some detail.

40621 **(IFT-P—09/84) 2-d N=1 and 4-d N=2 Yang-Mills SUSY models on the lattice.** Aratyn, H.; Goto, M.; Zimerman, A.H. (Instituto de Fisica Teorica, Sao Paulo (Brazil)). 1984. 46p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701698.

Supersymmetric interacting models, like the two-dimensional N = 1 Wess-Zumino model and N=2 Yang-Mills theory, are constructed on the space lattice. The Becher-Joos techniques, for the Dirac-Kahler formulation on the lattice, are extensively used in order to obtain the supercurrents and Hamiltonians on the lattice, even in the interacting case. It is shown that it is possible to construct the invariant actions for these models with the correct classical continuum limit. The work is based on the new method of putting the fields in the adjoint representations on the lattice.

40622 (INIS-mf—9311, pp 237-259) **Testing the standard model via radiative corrections.** Sakakibara, S. (Mainz Univ. (Germany, F.R.). Inst. fuer Physik). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

I describe how to understand the nature of radiative corrections and what one can expect from their analysis. I start with examples in quantum electrodynamics (QED) that provide us with some keys to understand the nature of radiative corrections. Then the standard model is presented, and the relation of the gauge boson masses and the low-energy parameters is discussed in some detail.

40623 **(ITEF—176(1983)) Relativistic Rankine-Hugoniot equations with allowance for radiation and electron-positron pair production.** Morozov, Yu.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1983. 54p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE85701726.

The Taub equations are derived and analysed with allowance for radiation effects and electron-positron pairs production. For perfect gas and an equation of state using γadiabate index a series of relatively simple solutions of these equations at various widely applied approximations is obtained. Equations of state for Maxwell particles momentum distribution and Fermi-Dirac distribution in non-vacuous approximation is in a form which permits analytical determination of the proper adiabaticity coefficients in approximate expressions for Taub equation solutions. The results of such calculations for a wide interval of values of initial densities are presented. 26 references, 2 figures, 2 tables.

40624 **(JINR—E-2-84-228) Vacuum problem in the Schwinger model.** Ilieva, N.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 10p. (CONF-8404244—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701699.

From 7. all-union conference on problems of quantum field theory; Alushta, USSR (21 Apr 1984).

The Schwinger model with quantum motions of bosonic and fermionic vacua is considered. The physical vacuum is defined as a coherent state of the observable fields. Quark-condensate values are found, which depend on the gauge field topological degeneration parameter.

40625 **(JINR—E-2-84-257) Dynamic origin of Wess-Zumino massless model.** Chizhov, M.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 8p. (CONF-8404244—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701700.

From 7. all-union conference on problems of quantum field theory; Alushta, USSR (21 Apr 1984).

A local Lorentz-invariant Hermitian combination of (pseudo) scalar and Weyl spinor fields is used as an initial interaction in self-consistent equations of kinetic terms. The solution of these equations in an approximation of the leading logarithmic-divergent diagrams provides the supersymmetric Wess-Zumino massless model effectively.

40626 **(JINR—E-2-84-479) No anomaly is observed.** Avdeev, L.V.; Kazakov, D.I.; Tarasov, O.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 5p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701727.

The two-loop anomaly in supersymmetric gauge theories discussed in a recent paper by R. van Damme and G. 't Hooft is considered. We find that this is due to some mistakes in calculations. In fact, it is possible to transform the theory regularized by the conventional dimensional regularization into the dimensionally reduced one by means of finite local counter-terms. So, no anomaly is observed. 17 references, 1 figure.

40627 (JINR—E-2-84-499) Formulation of euclidean QED manifestly obeying conditions of gauge, translational and rotational invariance. Zastavenko, L.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701737.

The Euclidean QED is considered in order to get its formulation which would be simultaneously and manifestly invariant under gauge transformations, translations, and rotations. The main point of the consideration is the introduction, instead of usual variables Asub(μ), phi, of gauge-invariant variables Bsub(μ), eta through the equations Bsub(β) = Asub(β)-dβlambda, eta = exp[-ielambda]phi, lambda = $<L>^{-1}$dβAsub(β), where $<L>$ -4-dimensional Laplace operator. Using correspondingly transformed Lagrangian one could construct Green functions which are invariant under the above three groups of transformations. One may hope to get the Green functions of the usual pseudo-Euclidean QED through an analytical continuation of our Green functions. Such pseudo-Euclidean Green functions will be, probably gauge invariant under Lorentz transformations, and translations. So, one would get the formulation of the pseudo-Euclidean QED which is, probably, manifestly gauge and Poincare invariant. 6 references.

40628 (JINR—E-2-84-660) Six- and eight-dimensional gluon condensates from lattice QCD. Makhaldiani, N.; Muller-Preussker, M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1984. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701728.

The $<G\gamma 3>$ and $<G^4>$-type gluon condensates are estimated from expectation values of appropriate lattice operators which have been evuluated by Monte-Carlo simulation of lattice QCD in quenched approximation. The $<G\gamma 4>$ values found indicate a strong violation of the factorization hypothesis $<G^4>$ approximately $<G^2>^2$. 18 references, 5 figures, 2 tables.

40629 (JINR—R-2-84-229) New procedure for finite-dimensional approximations of path integrals. Fiziev, P.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701729.

From 7. All-union conference on problems of quantum field theory; Alushta, USSR (1984).

It is found out that for the calculation of path integrals one should take into account the presence of an infinite dimensional group of homotopical path transformations on the Mayer foliation of phase space of the mechanical system, transformations under which the classical action is invariant. A procedure for factorization of the Faddeev-Popov type over the volume of this group in the path integral is suggested. It is based on a new formula for matrix elements of the evolution quantum operator during short times. It enables one to obtain a space of quantum states with its metric, a new rule of correspondence between classical and quantum quantities, and a quantum propagator. Relation between classical and quantum symmetries is discussed. Application of the procedure proposed for calculating path integrals is exemplified. 42 references.

40630 (JINR—R-2-84-458) Stochastic quantization of Abelian fields. Buzhek, V.; Ibadov, R.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701730.

A modified version is proposed for the stochastic quantization of gauge Abelian fields, in which the field evolution in a fictitious time is described by the Langevin equation. The right-hand side of this equation contains the variational derivative of the free action only. In this approach noise is responsible for quantization of the classical system and interaction in it. It is shown by the scalar electrodynamics that this method allows quantization of Abelian fields without gauge fixation. 6 references.

40631 (JINR—R-2-84-466) About quantum energy-momentum tensor for the Thirring model. Stoyanov, D.Ts.; Khadzhiivanov, L.K. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701731.

A possibility to construct an improved energy-momentum tensor for the quantum Thirring model is considered. Using the bozonization method, the equivalence of both expressions for this tensor, that are currently used in the literature, is proved. This leads to the appearance of the Virasoro algebra in this model too. The quantum Lagrangian is also obtained, that gives rise to the renormatlized Thirring equation. 21 references.

40632 (JINR—R-2-84-672) Hybrid model of the chiral field and relativistic string. Isaev, A.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701732.

A two-dimensional model, which has the features of the chiral field model with the Wess-Zumino term and of the relativistic string model, is considered. An auxiliary spectral problem for this model in the Hamiltonian approach is constructed and a generating function for an infinite number of involutory integrals of motion is obtained. 9 references.

40633 (KMU-HEP—84-03) Improved mean-field calculation for the lattice Abelian Higgs model. Pertermann, D. (Karl-Marx-Universitaet, Leipzig (German Democratic Republic). Sektion Physik). Apr 1984. 30p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701733.

We consider the lattice Abelian Higgs model with frozen radial degrees of freedom using the mean-field approximation with corrections. The free energy corrections contain essential 0(1) and 0(1/d) terms. In the weak coupling region the behaviour of the frequencies arising in the expansion of action allows to distinguish the Higgs from the Coulomb phases. Analytical results are presented for all phase transition lines. The phase structure obtained is in qualitative agreement with Monte-Carlo calculations for Higgs charges q = 1, 2 and 6.

40634 (KMU-HEP—84-04) Stochastic quantization and supersymmetry. Kirschner, R. (Karl-Marx-Universitaet, Leipzig (German Democratic Republic). Sektion Physik). Apr 1984. 18p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701738.

In the last years interest in stochastic quantization has increased. The method of quantization by stochastic relaxation processes has been proposed by Parisi and Wu, inspired by the extensive application of Monte Carlo simulations to quantum systems. Starting with the classical equations of motion of the system (field theory) and adding random force terms - the random force obeys a Gaussian distribution (white noise) - stochastic differential equations are obtained, in this context called Langevin equations, which are a central object in the theory of stochastic processes.

40635 (KMU-HEP—84-06) Stochastic quantization of gauge theories. Kirschner, R. (Karl-Marx-Universitaet, Leipzig (German Democratic Republic). Sektion Physik). May 1984. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701734.

The stochastic relaxation system describing an n - dimensional gauge theory is formulated as a field theory in a superspace consisting of the n space dimensions, the additional time and two Grassmann variables. It is established the relation of the superspace field theory and the n - dimensional gauge theory. The Langevin equation is derived for the abelian case. There is no unbounded diffusion along the gauge orbits. The resulting random force is not a white-noise process.

40636 **(KMU-HEP—84-07) Monte Carlo study of a 1+1 dimensional N=2 Wess-Zumino model on the lattice in the local Hamiltonian method.** Schiller, A.; Ranft, J. (Karl-Marx-Universitaet, Leipzig (German Democratic Republic). Sektion Physik). Jun 1984. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701735.

Based on a supersymmetric subalgebra involving only the Hamiltonian the lattice N=2 Wess-Zumino model in 1+1 dimensions is formulated in such a way that it can be investigated within the local Hamiltonian Monte Carlo method. It is found evidence for the existence of topological excitations in the model, but no evidence is found for the breaking of supersymmetry within numerical accuracy.

40637 **(LBL—19671) Classical geometrical interpretation of ghost fields and anomalies in Yang-Mills theory and quantum gravity.** Thierry-Mieg, J. (Lawrence Berkeley Lab., CA (USA); Centre National de la Recherche Scientifique, 92 - Meudon-Bellevue (France)). 14 May 1985. Contract AC03-76SF00098. 7p. (CONF-8503141—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014537.

From Symposium on anomalies, geometry and topology; Argonne, IL, USA (28 Mar 1985).

The reinterpretation of the BRS equations of Quantum Field Theory as the Maurer Cartan equation of a classical principal fiber bundle leads to a simple gauge invariant classification of the anomalies in Yang Mills theory and gravity.

40638 **(SLAC-PUB—3698) Holonomy anomalies.** Bagger, J.; Nemeschansky, D.; Yankielowicz, S. (Harvard Univ., Cambridge, MA (USA). Lyman Lab. of Physics; Stanford Linear Accelerator Center, CA (USA)). May 1985. Contract AC03-76SF00515. 5p. (CONF-8503141—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014354.

From Symposium on anomalies, geometry and topology; Argonne, IL, USA (28 Mar 1985).

A new type of anomaly is discussed that afflicts certain nonlinear sigma models with fermions. This anomaly is similar to the ordinary gauge and gravitational anomalies since it reflects a topological obstruction to the reparametrization invariance of the quantum effective action. Nonlinear sigma models are constructed based on homogeneous spaces G/H. Anomalies arising when the fermions are chiral are shown to be cancelled sometimes by Chern-Simons terms. Nonlinear sigma models are considered based on general Riemannian manifolds. 9 refs. (LEW)

40639 **Nonperturbative propagators in quantum chromodynamics.** Larsson, T.I. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Physical Review [Section] D: Particles and Fields;* **32**: No. 4, 956-961(15 Aug 1985). Contract AC03-76SF00515.

Leading nonperturbative corrections to the quark and gluon propagators are derived following the assumption that the nonperturbative QCD vacuum can be described in terms of nonvanishing vac- uum expectation values for the composite operators [psi-barpsi] and [G/sub munu/ ²]. The nonperturbative quark propagator can be described in terms of a running gauge-dependent quark mass and a running normalization function. The nonperturbative gluon propagator can be described in terms of a running gauge parameter and a running normalization function.

40640 **New stochastic algorithm and its application to compact QED.** Dahl, D.; Blankenbecler, R. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Physical Review [Section] D: Particles and Fields;* **32**: No. 4, 977-985(15 Aug 1985). Contract AC03-76SF00515.

A new stochastic algorithm for calculating the properties of Hamiltonian lattice field theories is described. This approach improves the efficiency as well as the statistical accuracy of projector-method simulations. As an example, this new method (called parallel scoring) is applied to periodic QED. Parallel scoring is the software equivalent of parallel processing. Its advantages and disadvantages are illustrated and discussed. Numerical results from the application of the parallel-processing algorithm to periodic QED in two space dimensions are presented and compared to earlier work.

40641 **A three level atom with quantized field modes and coherent trapping.** Yoo, H.I. (Department of Physics and Astronomy, University of Rochester, Rochester, NY). pp 1033-1036 of Coherence and Quantum Optics V. Mandel, L.; Wolf, E. New York, NY; Plenum Press (1984). (CONF-830616—).

From 5. Rochester conference on coherence and quantum optics; Rochester, NY, USA (13 Jun 1983).

A coherent trapping phenomenon for the level population of a threelevel atom, which takes place on two-photon resonance, has been noted and well-studied by a semi-classical approach where the classical electromagnetic fields are regarded as given. In this paper, the authors deal with a closed system of one or two quantized field modes and a three-level atom (Λ-type) interacting with each other via the non-vanishing atomic dipole matrix elements d_{12} and d_{23}. It is shown that the condition for the coherent trapping determines not only the atomic state but also the field state for the two mode case. In the two mode case, mode l (left) couples with the atom by d_{12} and mode r (right) by d_{23}. The one mode case with its frequency w can be regarded as a special case of the two modes with w / sub l/ = w /sub r/ = w.

40642 **Status of perturbative QCD.** Ellis, R.K. (Istituto Nazionale di Fisica Nucleare, Rome (Italy); Fermi National Accelerator Lab., Batavia, IL (USA)). pp 191-195 of Proceedings of HEP83. International Europhysics conference on high energy physics, Brighton (UK), 20-27 July, 1983. Guy, J. (Rutherford Appleton Lab., Chilton (UK)); Costain, C. (eds.). Chilton, England; Rutherford Appleton Laboratory (1983). (CONF-830718—).

From International Europhysics conference on high energy physics; Brighton, UK (20 Jul 1983).

In this paper the status, within the framework of perturbative QCD is discussed, of four topics which have received theoretical attention in the last year. They are, jets at the CERN Sp p bar S collider, power corrections to leptoproduction, hard scattering off nuclear targets, the photon structure function.

6455 Scattering Theory

40643 **(PB—85-189462) Coincidence form factors in electron scattering. Final report.** O'Connell, J.S. (National Measurement Lab., Washington, DC (USA). Nuclear Radiation Div.). 1984. 21p. Published in Proceedings of Workshop of the Bates Users Theory Group (3rd), Massachusettes Institute of Technology, Cambridge, MA, July 23-24, 1984, p1-21.

Sponsored by Connecticut Univ. Research Foundation, Storrs.

The two-body breakup cross section of inelastic electron scattering is presented and discussed. Examples of model calculations and some data are given for resonances, direct reactions, pion production, and scattering from quarks.

65 PHYSICS II

6510 Nuclear Physics

REFER ALSO TO CITATION(S) 39173, 39174, 40498

40644 **(BNL-NCS—51771-Ed.1-Suppl.1) Integral charged particle nuclear data bibliography. Literature scanned from April 1, 1984-March 31, 1985. First edition, Supplement 1.** Holden, N.E.; Ramavataram, S.; Dunford, C.L. (Brookhaven National Lab., Upton, NY (USA)). Apr 1985. Contract AC02-76CH00016. 59p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85014388.

The literature cited cover data on collisions in which the incident particle energy has a minimum energy of less than 100 MeV in the laboratory system, the data including excitation functions, or thick target or product yields leading to the formation of a ground or metastable state. Such quantities are included as fission yields, isomeric ratios, and excitation functions for specific particle groups

where such data readily yield information on the excitation functions or thick target yields for the ground or metastable state. Selected compilations, evaluations, and reviews of charged-particle nuclear data are also listed. The bibliography is indexed by target and by residuals. (LEW)

40645 **(CEA-N—2406) Theoretical approaches to heavy ion reaction mechanisms. Proceedings.** Lepage, F. (ed.). (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). 1984. 181p. (CONF-8405179—). NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948.

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

This booklet contains copies of the short written contributions to the Paris Conference (14-18 May 1984). Some of the authors have wished to present it orally in a special session. Its program will be found in the proceedings of the Conference published by Nuclear Physics.

40646 **(CONF-850507—46) Summary talk covering application-oriented sessions.** Peelle, R.W. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014649.

From International conference on nuclear data for basic and applied science; Santa Fe, NM, USA (13 May 1985).

Some progress is mentioned in nuclear data, including: nonfuel actinide cross sections, fusion charged particle reactions, lithium-7 breakup reaction, neutrons per fission, decay heat from fission products, the form of the fission spectrum, and neutron scattering differential cross sections. Trends are then identified, particularly N(E,t) for delayed neutrons, internationally focussed efforts to resolve outstanding problems, dosimetry cross sections and techniques, fusion integral experiments, data adjustment, rigorous analysis of differential data, reconsideration of "completed" data areas, and particle emission cross sections for fusion systems. Challenges pertaining to data for applications are listed, including neutron kerma data for neutrons above 10 MeV, helium production from neutrons on boron-10, the resonance and thermal regions of fuel nuclides, and tightening of accuracies. (LEW)

40647 **(CRN-PN—84-10) Isobaric mass equation for A=1-45 and systematics of Coulomb displacement energies.** Antony, M.S.; Britz, J.; Bueb, J.B.; Pape, A. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires). Jun 1984. 71p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85751938.

The mass excesses of members of T=1/2, 1, 3/2 and 2 multiplets are tabulated for A< = 45 and the coefficients of the isobaric multiplet mass equation are evaluated. Also given are the isovector and the isotensor parts of the Coulomb energy, their associated matrix elements reduced with respect to isospin, nuclear radii, and Coulomb displacement energies. The data and systematics are presented in 11 tables and 15 figures.

40648 **(GSI—84-89-Prepr.) New insight into relativistic heavy ion physics through 4π data.** Gutbrod, H.H.; Doss, M.; Gustafsson, H.A.; Kolb, B.; Loehner, H.; Ludewigt, B.; Poskanzer, A.M.; Ritter, H.G.; Wieman, H. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). Nov 1984. 23p. Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt, Germany, F.R.

We have a look at the question of thermalization - global or local, a look at the various apparent temperatures, the cluster production, the emission patterns and the sizes of the emitting systems.

40649 **(INDC(CCP)—229/L) Translation of selected papers published in Nuclear Constants 1(50) 1983.** (International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee). Nov 1984. 59p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781276.

Russian original distributed as INDC(CCP)-213/G.

Separate entries were prepared for the three papers entitled: Investigation of the Mechanism of Fast Neutron Scattering by Even Isotopes of Molybdenum; Evaluation of Fast-Neutron Radiative Capture Cross-Sections for Samarium and Europium Odd Isotopes; and Covariance Matrix of Experimental Data on the Energy Dependence of anti nu/sub p/ for Neutron-Induced Fission of the Nuclei ^{233}Th, ^{236}U, ^{238}U, ^{237}Np. (WHK)

40650 (JINR—D-7-83-644, pp 526-530) **Experimental program at GANIL.** Detraz, C. 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The experimental program at GANIL is briefly discussed. The ion velocities provided by GANIL allow to study the evolution from the mean field description of the nuclear system produced in a nucleus-nucleus collision to the many individual nucleon description when the energy of the projectile increases from 10 to 100 MeV per nucleon. The main features of the nuclear physics program (reaction mechanism studies, production of exotic nuclei and so on) are considered. Some first physics results are presented.

40651 (NEANDC(J)—100/U, pp 1-22) **Fission product and actinide data status in ENDF/B.** England, T.R.; Young, P.G.; Schenter, R.E.; Mann, F.M.; Reich, C.W. (Los Alamos National Lab., NM). Oct 1984. JAERI, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan. File Number TI85901067. (JAERI-M—84-182; CONF-8403179—).

From NEANDC topical conference on measurements and evaluations of nuclear data and decay heat for fission products; Tokai-mura, Japan (14 Mar 1984).

In this report, we direct our comments at the improvements we feel are needed for ENDF/B-VI, irrespective of the time scale or probability of implementation. Additionally, we limit our considerations to fission products and heavy nuclides (which we loosely call actinides) and specifically to plans at Los Alamos National Laboratory (LANL), Hanford Engineering and Development Laboratory (HEDL), and Idaho National Engineering Laboratory (INEL). In our coverage we emphasize cross sections and yields for fission products and decay data for both fission products and actinides. We do not attempt complete coverage of planned evaluations of actinide cross sections nor other ENDF/B general and special purpose files (e.g., General Purpose, Activation, Standards, etc.), although some of the data we cite lies in those files. However, our summary of data content in the current ENDF/B-V files is complete for fission products and actinides. Section II compares the content of Versions IV and V of ENDF/B and provides references for more complete descriptions of the fission product and actinide data files. The Pandemonium problem is described in Sec. III, and illustrations of discrepancies between experimental and calculated results that we attribute to this effect are given. Section IV summarizes the data expansion that is planned for ENDF/B-VI in the areas of fission-product yields and cross sections as well as decay data for fission products and actinides. Finally, our concluding remarks are given in Sec. V.

40652 (NEANDC(J)—100/U, pp 23-30) **Evaluation of fission product neutron cross sections for JENDL.** Kawai, M.; Iijima, S.; Kikuchi, Y.; Nakajima, Y.; Nakagawa, T.; Watanabe, T.; Sasaki, M.; Aoki, T.; Matsunobu, H.; Zukeran, A. (Japan Atomic Energy Research Institute, Tokai). Oct 1984. JAERI, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan. File Number TI85901067. (JAERI-M—84-182; CONF-8403179—).

From NEANDC topical conference on measurements and evaluations of nuclear data and decay heat for fission products; Tokai-mura, Japan (14 Mar 1984).

Results of integral tests of JENDL neutron cross sections are reported. Comparisons are given between calculated and experimental results for a number of nuclei. Improvements incorporated in JENDL-2 are briefly outlined and plans for further testing are described.

40653 (NEANDC(J)—100/U, pp 31-39) **Present status and future programs of evaluation of decay heat for fission products in Japan.** Matumoto, Z.; Akiyama, M.; Nakasima, R.; Tasaka, K.; Katakura, J.; Ihara, H.; Yoshida, T.; Iijima, S. (Japan Atomic Energy Research Institute, Tokai). Oct 1984. JAERI, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan. File Number TI85901067. (JAERI-M—84-182; CONF-8403179—).

From NEANDC topical conference on measurements and evaluations of nuclear data and decay heat for fission products; Tokai-mura, Japan (14 Mar 1984).

Decay powers and decay heat from the fission of U-235 and Pu-239 calculated using JNDC, Version 1 data are presented and compared with experimental data. JNDC, Version 1.5 was made to attempt to resolve discrepancies between the calculated and experimental data. Results for decay powers for this version are given. Plans for further evaluation of the data base are described.

40654 (NEANDC(J)—100/U, pp 40-41) **Fission product nuclear data measurements and evaluations at the Studsvik Science Research Laboratory.** Rudstam, G. (Studsvik Science Research Lab., Nykoeping, Sweden). Oct 1984. JAERI, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan. File Number TI85901067. (JAERI-M—84-182; CONF-8403179—).

From NEANDC topical conference on measurements and evaluations of nuclear data and decay heat for fission products; Tokai-mura, Japan (14 Mar 1984).

The experimental program is focused on fundamental studies of short-lived fission products. This program comprises measurements of specific properties such as total β decay energies, half-lives, and the emission of delayed neutrons. More complete spectroscopic investigations are carried out for especially interesting nuclides. Because of the great importance of macroscopic effects of the fission products in nuclear fuel the group is also engaged in applied research with the view to measure certain quantities and to evaluate integrated effects. Examples of this is the β part of the decay heat, the delayed-neutron energy spectrum and its time dependence, and the fission yields. The decay heat problem is also attacked by integral measurements of the β and γ spectra emitted from irradiated fissile nuclides using a Van de Graaff-accelerator.

40655 (NEANDC(J)—100/U, pp 42-46) **Decay heat calculation with the C.E.A. radioactivity data bank.** Duchemin, B.; Blachot, J.; Nimal, B.; Nimal, J.C.; Veillaut, J.P. (CEN Saclay, Gif Sur Yvette, France). Oct 1984. JAERI, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan. File Number TI85901067. (JAERI-M—84-182; CONF-8403179—).

From NEANDC topical conference on measurements and evaluations of nuclear data and decay heat for fission products; Tokai-mura, Japan (14 Mar 1984).

For a long time the French CEA has developed a radioactivity data bank. This bank is updated using ENSDF and some recent experimental results. The fission product part of this library is currently used for shielding source and decay heat calculations. A computer code called PEPIN, using direct summation method has been developed and is briefly described. A comparison is made with other calculations and available experiments.

40656 (NEANDC(J)—100/U, pp 47-54) **Measurements of global fission products cross sections in PWR spectrum.** Gaucher, P.; Deidier, L.M. (Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-lez-Durance, France). Oct 1984. JAERI, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan. File Number TI85901067. (JAERI-M—84-182; CONF-8403179—).

From NEANDC topical conference on measurements and evaluations of nuclear data and decay heat for fission products; Tokai-mura, Japan (14 Mar 1984).

Fission product absorption is very important in power reactors: for a large part, the reactivity loss during irradiation is due to the fission product capture. With the exception of 135 Xe, this absorption leads during one reactor cycle to a loss of around 3000-3500 pcm in reactivity, whereas the total loss due to fuel spending is of around 6000 pcm. 72% of this effect comes from the following nuclides: 147 Pm, 149 Sm, 152 Sm, 95 Mo, 99 Tc, 103 Rh, 131 Xe, 133 Cs, 143 Nd, 145 Nd. The remaining 28% comes from a very large number of nuclides. In fact, for power reactor calculations, only global fission product absorption is needed. Experimental programs developed in France are therefore based on direct measurements of the global effects of spent fuel fission products, in order to qualify calculation means. Some methods and results are described here.

40657 (NEANDC(J)—100/U, pp 55-60) **Some investigations on the contribution of the internal conversion process to the decay heat of a LMFBR.** Karouby-Cohen, N. (Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-lez-Durance, France). Oct 1984. JAERI, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan. File Number TI85901067. (JAERI-M—84-182; CONF-8403179—).

From NEANDC topical conference on measurements and evaluations of nuclear data and decay heat for fission products; Tokai-mura, Japan (14 Mar 1984).

The internal conversion process contributes not negligibly to the total decay heat. The contribution of this phenomenon has been investigated using BLACHOT-FICHE data. This study has shown the importance of internal conversion process for the calculation of the decay heat of fission products, i.e. up to 10 divided by 15%. It has also shown the need of reliable and precise data on the internal conversion process in this type of decay data libraries.

40658 (NEANDC(J)—100/U, pp 61-74) **Model for fission-product calculations.** Smith, A.B. (Argonne National Lab., IL). Oct 1984. JAERI, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan. File Number TI85901067. (JAERI-M—84-182; CONF-8403179—).

From NEANDC topical conference on measurements and evaluations of nuclear data and decay heat for fission products; Tokai-mura, Japan (14 Mar 1984).

Many fission-product cross sections remain unmeasurable thus considerable reliance must be placed upon calculational interpolation and extrapolation from the few available measured cross sections. The vehicle, particularly for the lighter fission products, is the conventional the optical-statistical model. The applied goals generally are: capture cross sections to 7-10% accuracies and inelastic-scattering cross sections to 25-50%. Comparisons of recent evaluations and experimental results indicate that these goals too often are far from met, particularly in the area of inelastic scattering, and some of the evaluated fission-product cross sections are simply physically unreasonable. An example of these discrepancies is shown. The evaluated inelastic-scattering cross sections of palladium are nearly a 100% discrepant with observation and the isotopes are prominent fission products with large inelastic-scattering cross sections at relatively low energies. It is difficult to avoid the conclusion that the models employed in many of the evaluations are inappropriate and/or inappropriately used.

40659 (NEANDC(J)—100/U, pp 75-99) **Fission product nuclear data measurements at the JAERI linac.** Mizumoto, M.; Nakajima, Y.; Ohkubo, M.; Sugimoto, M.; Furuta, Y.; Kawarasaki, Y. (Japan Atomic Energy Research Institute, Tokai). Oct 1984. JAERI, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan. File Number TI85901067. (JAERI-M—84-182; CONF-8403179—).

From NEANDC topical conference on measurements and evaluations of nuclear data and decay heat for fission products; Tokai-mura, Japan (14 Mar 1984).

Neutron cross sections of fission products are of great importance for reactor application, although it seems that the emphasis on the needs of more accurate data is gradually decreasing partly due to financial problems for fast reactor development program. But, average capture cross sections in the keV region have been still requested in WRENDA with high priority. A systematic study of the average properties of resonance parameters, strength functions and level spacings provides valuable information in order to understand neutron interaction mechanism with nuclei. The measurements of fission product cross sections carried out at the JAERI Linac were reviewed by Yamamuro and Asami in the 1979 Bologna FP specialist meeting. In the present report, the only recent results since 1980 will be summarized. Some of these experimental results have been already published elsewhere.

40660 (NEANDC(J)—100/U, pp 100-107) **Pygmy resonance appeared in keV-neutron capture γ-ray spectra of nuclei N = 82 - 126.** Igashira, M.; Udagawa, K.; Natsume, T.; Fukui, H.; Shimizu, M.; Komano, H.; Kitazawa, H.; Yamamuro, N. (Tokyo Institute of Technology, Japan). Oct 1984. JAERI, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan. File Number TI85901067. (JAERI-M—84-182; CONF-8403179—).

From NEANDC topical conference on measurements and evaluations of nuclear data and decay heat for fission products; Tokai-mura, Japan (14 Mar 1984).

The authors have measured capture γ-ray spectra of Pr, Tb, Ho, Ta and Au with keV neutrons and observed the pygmy resonance in all these spectra. Remarkable features of the pygmy resonance were found to be that with neutron number the resonance energy increases linearly and the electric dipole strength exhausted in the resonance increases exponentially.

40661 **(ZfK—530) Joint annual report 1983. [Nuclear physics research at ZFK Rossendorf and other GDR institutions].** Hennig, K. (ed.). (Bergakademie Freiberg (German Democratic Republic). Sektion Physik; Friedrich-Schiller-Universitaet, Jena (German Democratic Republic). Sektion Physik; Humboldt-Universitaet, Berlin (German Democratic Republic). Sektion Physik; Karl-Marx-Universitaet, Leipzig (German Democratic Republic). Sektion Physik; Technische Univ., Dresden (German Democratic Republic). Sektion Physik; Akademie der Wissenschaften der DDR, Leipzig. Zentralinstitut fuer Isotopen- und Strahlenforschung; Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). Jun 1984. 181p. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE85701689.

Results of research work carried out at the ZfK Rossendorf and other GDR institutions working in the field of nuclear physics are presented in individual summaries covering the following topics: nuclear reactions, spectroscopy and theory, applied methods of nuclear physics, accelerators, nuclear electronics, computer applications and codes.

40662 **Recent references, January through April 1985.** Ramavataram, S. (Brookhaven National Laboratory, Upton, New York 11973, USA). *Nuclear Data Sheets;* **45**: No. 2, 251-251(Jun 1985). Contract AC02-76CH00016.

In support of a continuing program of systematic evaluation of nuclear structure data, the National Nuclear Data Center maintains a complete computer file of references to the nuclear physics literature. Each reference is tagged by a keyword string, which indicates the kinds of data which are contained in the article.

6511 Experimental Techniques

REFER ALSO TO CITATION(S) 40251, 40783

40663 **(BNL—36606) E802 data acquisition complex.** LeVine, M.J. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 7p. (CONF-850579—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85012272.

From 4. topical conference on computerized data acquisition in particle and nuclear physics; Chicago, IL, USA (19 May 1985).

The data acquisition architecture planned for experiment E802 is described. A VAX 11/785 will be front-ended by a VME-based array of 68000-family microprocessors, which will be used as intelligent CAMAC crate controllers, event builders, and to augment the computing power of the VAX for on-line analysis of the data. 4 refs.

40664 **(BNL—36646) Neutron resonance averaging with filtered beams.** Chrien, R.E. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 20p. (CONF-850635—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014191.

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

Neutron resonance averaging using filtered beams from a reactor source has proven to be an effective nuclear structure tool within certain limitations. These limitations are imposed by the nature of the averaging process, which produces fluctuations in radiative intensities. The fluctuations have been studied quantitatively. Resonance averaging also gives us information about initial or capture state parameters, in particular the photon strength function. Suitable modifications of the filtered beams are suggested for the enhancement of non-resonant processes.

40665 (INIS-mf—9573-Vol.1, pp 96-167) **Nuclear physics and nuclear instrumentation.** Martinez Lugo, R.; Robles Galvez, J.C. (Instituto Nacional de Investigaciones Nucleares, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781445.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

The study of radioactivity is introduced, explaining the radioactive decay law and the radionuclide table; so too, the interaction between the matter and the radiation is explained. Also described is the technique used to detect the presence of nuclear radiation and to determine its intensity, its energy and its associated properties. At the same time are given the basis for the instrumentation selection that will be used in that radiation measurement, equally given is the accepted rules for the designment and construction of nuclear instrumentation at a laboratory level and different instruments are illustrated built in modular form under the accepted rules.

40666 (INIS-SU—282, pp 394) **Charge plunger method on heavy ion beams.** Majdikov, V.Z.; Surovitskaya, N.T. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40667 (JAERI-M—84-010, pp 15-33) **Measurements of neutron capture cross sections.** Nakajima, Yutaka (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Mar 1984. (In Japanese). JAERI-Tokai-Mura, Naka-gun, Ibaraki-ken, 319-11, Japan. File Number TI84901547. (CONF-8311187—; NEANDC(J)—97/AU; INDC(JPN)—84/G).

From JAERI seminar on nuclear data; Tokai, Japan (30 Nov 1983).

A review of measurement techniques for the neutron capture cross sections is presented. Sell transmission method, activation method, and prompt gamma-ray detection method are described using examples of capture cross section measurements. The capture cross section of ^{238}U measured by three different prompt gamma-ray detection methods (large liquid scintillator, Moxon-Rae detector, and pulse height weighting method) are compared and their discrepancies are resolved. A method how to derive the covariance is described.

6512 Nuclear Properties And Reactions, A=1-5, Theoretical

REFER ALSO TO CITATION(S) 41010

40668 **(BNL-NCS—36553) Light mass elements total half-lives for selected long-lived nuclides.** Holden, N.E. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 12p. (CONF-8506130—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014217.

From International Committee for Radionuclide Metrology meeting; Grenoble, France (3 Jun 1985).

In the past, many compilations and evaluations of half-lives have been made which have uncritically accepted authors' values and uncertainties. They have merely recommended weight-averaged reported results. This evaluation attempts to reanalyze each experiment in the literature including an estimate of the standard deviation utilizing, where possible, an estimate of the systematic error. This paper constitutes a preliminary step in the process of

recommending values. The long-lived nuclides of light elements are of interest for their use in dating methods and for calculating cosmic-ray exposure ages of meteorites. Experimental data on the half-lives of selected nuclides have been evaluated and recommended values and uncertainties are presented for the following nuclides: ^{3}H, ^{10}Be, ^{14}C, ^{26}Al, ^{39}Ar, ^{40}K, ^{50}V, ^{53}Mn, ^{70}Ge, ^{87}Rb, ^{93}Nb, ^{107}Pd, ^{113}Cd, ^{115}In and ^{123}Te. The impact of the recommended ^{14}C half-life of 5715 years on the carbon dating technique, which uses the Libby value of 5568 years, will be discussed. Also the possible primordial occurrence of ^{92}Nb is now definitely ruled out by the recommended half-life of 3.7×10^{7}. Finally, based on the recommended ^{26}Al half-life value, the ^{21}Ne production rate for calculating cosmic-ray exposure ages remains too high, compared to rates using the ^{53}Mn and ^{10}Be half-life values. 15 tabs.

40669 (CEA-N—2406, pp 64-68) **Microscopic molecular picture of the ^{12}C-^{12}C scattering.** Hahn, D.; Scheid, W. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

In the framework of the two-center shell model we have developed a molecular reaction theory for the scattering of light nuclei. As basis states we use molecular particle-hole states, where the spurious motion is projected out. With the Tamm-Dancoff method we obtain molecular intrinsic states of the ^{12}C-^{12}C system.

40670 (DOE/ER/53179—T4) **Nuclear spin-polarized HD, D_2, HT and DT solids, liquids and high density gases. Quarterly status report No. 5, March 1, 1985-May 31, 1985.** (Syracuse Univ., NY (USA). Dept. of Physics). 27 Jun 1985. Contract FG02-84ER53179. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014136.

Success is reported in attaining extremely pure o-D_2 in the 0.997-0.999 range by symmetry species conversion at a temperature of 4K on a partially activated charcoal catalyst. Spin-lattice relaxation times have been improved to over 1 minute. Long storage times and the possibility of liquefication without depolarizing the o-D_2 are expected. Super-pure o-D_2 may also be used to probe magnetic impurities on surfaces. In addition, 50 kV "white spectrum" x-ray irradiated solid D_2 experiments have yielded information on defect generation rates and defect lifetimes, as well as their effect on para-ortho D_2 conversion. Experiments have also been begun in epitaxial deposition of D_2 on HD, and HD on mostly p-H_2. Tests of a dilution refrigerator have been completed. (LEW)

40671 (INIS-SU—282, pp 444) **Modelless description of quarted nd-phase at low energies.** Grinyuk, B.E.; Simenog, I.V. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40672 (INIS-SU—282, pp 445) **Calculation of the $^{3}He+d \rightarrow {}^{3}He+p+n$ reaction in the range of neutron resonance interaction with ^{3}He.** Dubovoj, Eh.I.; Kertkoev, Z.F. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40673 (INIS-SU—282, pp 462) **Differential cross section of elastic N-N scattering in noneikonal approximation.** Golovanova, N.F.; Novozhilova, V.N.; Iskra, V. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40674 (LA-UR—85-2047) **Polarization transfer in inelastic scattering and pionic models of the EMC effect.** Carey, T.A.; Jones, K.W.; McClelland, J.B.; Moss, J.M.; Rees, L.B.; Tanaka, N.; Bacher, A.D. (Los Alamos National Lab., NM (USA); Indiana Univ. Cyclotron Facility, Bloomington (USA)). 1985. Contract W-7405-ENG-36. 3p. (CONF-850807—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014119.

From 6. international symposium on polarization phenomena in nuclear physics; Osaka, Japan (26 Aug 1985).

The aim of the experiment reported was to make a precise test of the enhanced pion field model in a medium-energy scattering experiment. The quantity probed is the spin-longitudinal response function, a measure of the nuclear pion density which is used explicitly in the pion-excess models of the EMC effect. The point of reference used is deuterium. The spin-dependent response functions for heavy targets and ^{2}H are compared using identical experimental techniques. The technique of complete polarization transfer is used to separate the spin-longitudinal and spin-transverse response in the continuum. The experiment consisted of precise determinations of the polarization transfer coefficients for 500 MeV protons inelastically scattered from Pb, Ca, and ^{2}H. The experiment utilized longitudinal, sideways, and normal polarized beams in conjunction with final polarization analysis from the focal-plane polarimeter of the high-resolution spectrometer. Quantities constructed from these data are the longitudinal and transverse spin-flip probabilities. Calculations were performed of the ratio of longitudinal to transverse response functions and of the EMC effect with the same model. No evidence was found for collectivity in the isovector spin-longitudinal response function. 10 refs. (LEW)

40675 (LBL—19795) **Spin polarization effects in the $^{3}H(d,n)^{4}He$ fusion reaction.** Conzett, H.E.; Rioux, C. (Lawrence Berkeley Lab., CA (USA)). Jun 1985. Contract AC03-76SF00098. 4p. (CONF-850807—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015253.

From 6. international symposium on polarization phenomena in nuclear physics; Osaka, Japan (26 Aug 1985).

A recent investigation has shown that the $^{3}H(d,n)^{4}He$ fusion reaction rate could be enhanced by a factor of 3/2 if the fusion plasma consisted of both polarized deuterons and tritons, forming exclusively the channel-spin $S = 3/2$, $J = 3/2^{+}$ state. This result follows simply from the statistical weights of the quartet $S = 3/2$ and doublet $S = 1/2$ initial states, with the assumption of the single $J = 3/2^{+}$ reaction amplitude. Since, with a small but nonzero $J = 1/2^{+}$ amplitude, the maximum enhancement of the reaction occurs at the peak of the $J = 3/2^{+}$ resonance, corresponding to a deuteron lab energy of 107 keV, it is of obvious interest to know what the enhancement would be at the lower energies that are typical of fusion plasmas. We are able to address this question by extending earlier calculations which gave the values of all of the spin-polarization observables at this $J = 3/2^{+}$ resonance in both the $^{3}H(d,n)^{4}He$ and the $^{3}He(d,p)^{4}He$ reactions.

40676 **Faddeev Calculation of three-nucleon force contribution to triton binding energy.** Chen, C.R.; Payne, G.L.; Friar, J.L.; Gibson, B.F. (Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa 52242). *Physical Review Letters;* 55: No. 4, 374-377(22 Jul 1985).

The configuration-space Faddeev equations are solved for Hamiltonians that include the Tucson-Melbourne and Brazil three-nucleon forces. Convergence in terms of the number of three-body partial waves is established. First-order perturbation-theory results are shown to be inadequate. Both three-nucleon forces produce approximately 1.5-MeV additional binding, which overbinds the triton.

40677 **Microscopic analysis of ^{6}Li (p, vector p)g.s. and ^{6}Li (p, vector p') (2.18 MeV) analyzing powers at 25, 35, and 45 MeV.** Poppe, C.H.; Dietrich, F.S.; Rowley, D.; Conzett, H.E.; Eversheim, D.; Rioux, C. (Lawrence Livermore National Lab., CA). *AIP (American Institute of Physics) Conference Proceedings;* No. 57, 226(1983). (CONF-821050—). Contract W-7405-ENG-48.

From Cyclotron facility workshop; Bloomington, IN, USA (27 Oct 1982).

The analyzing powers were measured for proton scattering to the ground state (1^+; T=0) and first excited state (3^+; T=0) of ^{6}Li at incident energies of 25, 35 and 45 MeV using the polarized beam of the LBL 88 in. cyclotron. ^{6}Li was chosen because a recent study of the Li isotopes described successfully various (p,p') and (p,n) cross sections in terms of a realistic effective force, however, analyzing powers were not treated. In the present work inelastic analyzing powers and cross sections are compared to Born approximation calculations which use the density-dependent complex central interaction of Brieva and Rook and the real spin-orbit and tensor interactions of Elliott. 2 references.

6513 Nuclear Properties And Reactions, A=6-19, Theoretical

40678 (CEA-N—2406, pp 87-90) **Complete fusion reaction at high energies.** Ohta, M.; Hatogai, K.; Okai, S.; Abe, Y. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

The ratio of the cross section of complete fusion to that of evaporation residue has been estimated for the $^{16}O+^{12}C$ system on the basis of the break-up fusion formula proposed by Kerman and McVoy. It is found that the complete fusion falls to zero at an incident energy between 20/A and 30/A MeV.

40679 (CONF-850807—2) **Measurement of the energy dependent beta asymmetry in the decay of ^{8}Li.** Bigelow, R.A.; Quin, P.A.; Freedman, S.J.; Napolitano, J. (Wisconsin Univ., Madison (USA). Dept. of Physics; Argonne National Lab., IL (USA)). 1985. Contract W-31-109-ENG-38. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85013873.

From 6. international symposium on polarization phenomena in nuclear physics; Osaka, Japan (26 Aug 1985).

Progress is reported on a new measurement of the beta decay asymmetry in ^{8}Li. Polarized ^{8}Li is produced via the reaction ^{7}Li(d,p)^{8}Li using vector polarized deuterons from a crossed beam polarized source. Plastic scintillation electron counters are used to measure asymmetry, tensor polarization correlation and to monitor beam current. Results are graphed and systematic error sources are discussed. 4 refs. (LEW)

40680 (INIS-SU—282, pp 209) **Excitation of respiratory resonances in scattering of s-shell nuclei on alpha particle.** Filippov, G.F.; Vasilevskij, V.S.; Nesterov, A.V. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40681 (INIS-SU—282, pp 366) **Isospin homogeneity of giant dipole resonances.** Ishkhanov, B.S.; Kapitonov, I.M. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40682 (INIS-SU—282, pp 405) **Excitation of low-lying states of light nuclei in the (e,e'), (π,π') and (γ,π) reactions.** Kaipov, T.D.; Kamalov, S.S. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40683 (INIS-SU—282, pp 197) **Photodisintegration of p-shell light nuclei.** Vasilevskij, V.S.; Chopovskij, L.L.; Filippov, G.F. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40684 (INIS-SU—282, pp 421) **Study on the mechanism of π^--meson absorption in the $^{12}C(\pi^-,n\alpha)^7$Li reaction.** Burkova, N.A.; Zhusupov, M.A.; Imambekov, O. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40685 (INIS-SU—282, pp 464) **Direct and exchange processes in alpha reactions on light nuclei.** Belyaeva, T.L.; Zelenskaya, N.S.; Teplov, I.B. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40686 (INIS-SU—282, pp 465) **Calculation of angular correlation function and spin-tensors of the density matrix in the $^{11}B(\alpha, t_1\gamma)^{12}C$ reaction.** Zelenskaya, N.S.; Ovchinnikova, A.A.; Teplov, I.B. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40687 (INIS-SU—282, pp 466) **Contribution of exchange processes in α-particles elastic scattering on light nuclei.** Zelenskaya, N.S.; Morzabaev, A.K. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40688 (INIS-SU—282, pp 467) **Interpretation of relation of ^{3}He and ^{4}He isotope production in ^{12}C nucleus fragmentation with the help of intranuclear cluster direct knock-out mechanism.** Galanina, L.I.; Zelenskaya, N.S. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40689 (INIS-SU—282, pp 468) **Microscopic approach to the reactions of γ-quanta cluster absorption at 80 MeV.** Glozman, L.Ya.; Neudachin, V.G. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40690 (INIS-SU—282, pp 474) **Application of the hyperspherical function method to analysis of the ^{6}Li + ^{12}C elastic scattering at different energies.** Saupe, G.; Shirokova, A.A.; Shitikova, K.V. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40691 (INIS-SU—282, pp 360) **Total cross sections of the alpha particles-nuclei interactions at 60 and 80 MeV.** Bulkin, V.S.; Badovskij, V.P.; Gorovenko, L.N. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40692 (INIS-SU—282, pp 379) **Production of light element isotopes near by boundary of nuclear stability in the heavy ion charge-exchange reactions.** Belozerov, A.V.; Borcha, K.; Gerlik, Eh. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40693 (JAERI-M—84-010, pp 353-364) **Study on the secondary neutron and photon emission by charged particle.** Uwamino, Yoshitomo (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Mar 1984. (In Japanese). JAERI-Tokai-Mura, Naka-gun, Ibaraki-ken, 319-11, Japan. File Number TI84901547. (CONF-8311187—; NEANDC(J)—97/AU; INDC(JPN)—84/G).

From JAERI seminar on nuclear data; Tokai, Japan (30 Nov 1983).

The secondary neutron and photon spectra from thick carbon, iron, copper and lead targets bombarded by 30-MeV p, 33-MeV d, 65-MeV ^{3}He and 65-MeV α were measured. The intranuclear-cascade-evaporation Monte Carlo calculation of neutron emission was done with the MECC-7 and LHI codes. The measured secondary neutron spectra were analyzed phenomenologically.

40694 (JINR—D-7-83-644, pp 324-331) **Fusion oscillations for symmetric light heavy-ion systems.** Poffe, N. (Oxford Univ. (UK). Nuclear Physics Lab.); Rowley, N.; Lindsay, R. (SERA (Socialist Environment and Resources Association), London (UK). Energy Group). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The problem of fusion oscillations for symmetric light heavy-ion systems is discussed. A recent experiment performed at Oxford shows that in the intermediate system (^{20}Ne+^{20}Ne) the oscillations are still present. The experimental data are considered in the framework of a simple penetration model. Experimental fusion cross section for ^{12}C+^{12}C is given. Excellent fit for the magnitude and phase of oscillations is obtained.

40695 (JINR—D-7-83-644, pp 279-287) **High-energy particle emission and search for the ^{10}He nuclei in heavy ion reactions.** Penionzhkevich, Yu.Eh. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The problem of studying the emission of high-energy charged particled in heavy ion reactions is discussed. The sum of experimental data proves that this process is direct, and for its interpretation it is possbie to use the model of direct reactions. The problem of stability of the ^{10}He nuclide is investigated in detail. The upper boundary of ^{10}He nucleus production in the ^{232}Th+^{11}B reaction is obtained, it proved to be equal 5×10^{-7} mb/sr. In order to have an unambig us answer to the problem of stability of ^{10}He nuclei it is necessary to obtain them in the ground state. With this purpose charge-exchange reactions can be most effective.

40696 (KIYI—83-12, pp 14-19) **Measurement and analysis of the angular correlation in the reaction (p,2p) on ^{6}Li at the 47 and 70 MeV incident protons.** Vdovin, A.I.; Kadkin, E.P.; Loshakov, I.I.; Pasechnik, M.V.; Saltykov, L.S. 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781033.

In Nuclear and physical researches on the isochronous cyclotron U-240 during 1982.

Experimental and theoretical results of studying ^{6}Li(p,2p)^{5}He reaction at 47 and 70 MeV incident isotopes are presented. Measurements are conducted in symmetric coplanar geometry. Experimental functions of 47 and 70 MeV proton angular correlation and theoretical functions of 47 MeV proton angular correlation are obtained. The calculation has been conducted in the supposition of both quasifree interaction using the method of t-matrix approximation with distorted waves and a two-stage process. Analysis of influence of parameters of proton wave function distortion on the type of angular correlation function is carried out. Comparison of experimental and theoretical results permitted to estimate the role of effects of descent from the energy surface and to calculate the value of ^{6}Li(p,2p)^{5}He reaction amplitude with account of different mechanisms of the reaction.

40697 (KIYI—83-12, pp 19-24) **^{6}Li(p,α)^{3}He reaction at 47,8-62,5 MeV energies.** Nemets, O.F.; Ostashko, V.V.; Povoroznik, O.M.; Urin, V.N.; Yasnogorodskij, A.M. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij); Barit, I.Ya.; Zuev, S.V. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781033.

In Nuclear and physical researches on the isochronous cyclotron U-240 during 1982.

Angular distributions of the ^{6}Li(p,α)^{3}He reaction in the THETAsub(c.n.) = 20-160 deg angular range are measured at 47.8-62.5 MeV proton energies on an extracted beam of the isochronous cyclotron U-240. The results obtained in the paper are analyzed together with data of other authors at lower energies by approximation of angular distributions by Legendre polynomials expansion. Deflection from smooth energy dependence of polynomial coefficents at energies corresponding to ^{7}Be nucleus excitation of about 50 MeV is observed.

40698 **Microscopic analysis of proton elastic scattering in the range 80-200 MeV.** Dietrich, F.S.; Petrovich, F. (Lawrence Livermore National Lab., CA). *AIP (American Institute of Physics) Conference Proceedings;* No. 57, 148(1983). (CONF-821050—). Contract W-7405-ENG-48.

From Cyclotron facility workshop; Bloomington, IN, USA (27 Oct 1982).

A systematic comparison is made of differential cross-section and analyzing-power data on ^{12}C, ^{28}Si, ^{40}Ca, ^{90}Zr, and ^{208}Pb at 80-200 MeV with calculations based on the single-step folding-model approach to the optical potential. In these calculations, proton densities have been inferred from electron scattering results, with neutron densities either the same as for protons (^{12}C, ^{28}Si, ^{40}Ca) or with a small neutron skin consistent with 800-MeV proton scattering results (^{90}Zr, ^{208}Pb). The effective two-body interactions that have been used are the Love-Franey t-matrix, a density-dependent interaction based on the Paris potential (calculated by von Geramb), and finally the Brieva-Rook density-dependent central interaction used with the spin-orbit part of the Love-Franey interaction.

6514 Nuclear Properties And Reactions, A=20-38, Theoretical

REFER ALSO TO CITATION(S) 40681, 40698, 40725, 40750

40699 (CEA-N—2406, pp 24-28) **Mean field approach to pion production in intermediate energy heavy ion collisions.** Tohyama, M.; Kaps, R.; Masak, D.; Mosel, U. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

The pion production in intermediate-energy heavy-ion collisions is studied in the mean field approximation to the nucleon distributions. Pion spectra are calculated in the slab geometry. Preliminary results in a finite geometry are also reported.

40700 (CEA-N—2406, pp 79-82) **Evaluation of non statistical effects in ^{20}Ne + ^{24}Mg reactions below 10 MeV/A.** Belery, P.; Cohilis, P.; El Masri, Y.; Gregoire, G.; Albinska, M.; Albinski, J.; Paic, G. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Results of a γ-particle experiment and an activation measurement are reported. They show clear evidences for the production of ^{43}Sc nuclei in coincidence with low energy protons while the statistical model predicts an almost zero cross section for this particular decay channel.

40701 (CEA-N—2406, pp 1-7) **Direct transfer reactions induced by 1760 MeV ^{40}Ar beam on ^{27}Al target nucleus.** Barrette, J.; Berthier, B.; Cisse, O. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Few-nucleon direct transfer reactions are induced by the GANIL 1760 MeV ^{40}Ar beam on the ^{27}Al target nucleus. Energy spectra of the continuum states are well fitted by the convolution of the Williams' level density formula with the diffractional model DWBA cross section.

40702 (CEA-N—2406, pp 116-122) **Quasi-symmetric two-body fragmentation of the ^{32}S + ^{12}C and ^{32}S + ^{24}Mg composite systems.** Belery, P.; Cohilis, P.; El Masri, Y.; Gregoire, G.; Albinski, J.; Grotowski, K.; Micek, S.; Planeta, R. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

In this report, we present our preliminary results for the symmetric two-body fragmentation of composite systems produced in reactions of 280 MeV ^{32}S^{9+} ions bombarding ^{13}C and ^{24}Mg target nuclei.

40703 (CEA-N—2406, pp 122-125) **Fragment production in the ^{20}Ne+^{27}Al system at 30 MeV/A.** Morjean, M.; Charvet, J.L.; Uzureau, J.L. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Fragments produced in the 30 MeV/A ^{20}Ne + ^{27}Al reaction have been detected from 5° to 50° between 3 MeV/A and 35 MeV/A. At least three different origins can be attributed to these fragments.

40704 (CEA-N—2406, pp 134-136) **Anisotropy ratio for proton inclusive production at 400 MeV/N.** Zwermann, W. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

The inclusive production of protons in intermediate energy nuclear collisions will be discussed within the framework of an independent multiple scattering approach, with particular emphasis on the anisotropy ratio, an observable which has received little attention so far. Using the almost analytical model of transport theory, the momentum distributions after each collision number by solving an equation of Fokker-Planck type with the distribution after the first collision as initial function. Results are presented.

40705 (IAEA-R—3114-F) **Quality assessment and consistency check of measured nuclear data up to 20 MeV including the range of resonances. Final report for the period 1 May 1982-30 April 1984.** Boedy, Z.T. (International Atomic Energy Agency, Vienna (Austria)). Sep 1984. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781060.

This is the final report of a research contract with the IAEA. The object is the compilation and evaluation of all the data on (n,t) and (n,3He) reactions cross-sections, respectively. The main results of the research are given (some discrepancies in the experimental data; analytic formulas for an empirical description of the data, separately for the even and odd nuclei with $z > 20$; methods to extrapolate to energies where measurements are missing; mass regions where data are needed), and publications by the authors with the detailed results are quoted.

40706 (INIS-SU—282, pp 358) **Effect of population of the magnetic substates of the 2^+_1 level on alpha particle inelastic scattering.** Bulkin, V.S.; Gorpinich, O.K.; Tokarevskij, V.V. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40707 (JINR—D-7-83-644, pp 173-181) **Application of methods of coherent optics to nuclear physics.** Izosimov, I.N.; Naumov, Yu.V. (Leningradskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Fizicheskij Inst.). 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Methods of polarization of nuclei with the aid of circular-polarized light with detection according to nuclear radiation, are discussed. The orientation process of Na nuclei in the case of optic pumping is considered. Coherent effects in the electron atom shell, Hanle effect and the crossing of levels in the optic radiation are investigated. Polarization degree of ^{22}Na fluorescence depending on the value of external magnetic field during irradiation by light of coherent polarization on the pulsed dye laser is studied. The method of obtaining coherent ensemble of atomic nuclei during irradiation of atoms by coherent polarization light is analyzed.

40708 (UCRL—53649) **Spin-flip (p,n) reactions on ^{26}Mg, ^{54}Fe, and ^{56}Fe at selected proton bombarding energies in the range of 17 to 25 MeV.** Aron, D.L. (Lawrence Livermore National Lab., CA (USA)). Jun 1985. Contract W-7405-ENG-48. 161p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE85015664.

New data are presented for the ^{26}Mg(p,n)^{26}Al reaction at E/sub p/ = 19.12 and 24.97 MeV, for the ^{54}Fe(p,n)^{54}Co reaction at E/sub p/ = 17.20, 18.60, and 24.60 MeV, and for the ^{56}Fe(p,n)^{56}Co reaction at E/sub p/ = 19.12 and 24.59 MeV. Data were taken with the LLNL Cyclograaff at 16 angles from 3.5° to 159.0°. A large detector at 23.8° with a long neutron flight path collected high resolution spectra. This large detector also collected separate 0° high resolution data on the ^{26}Mg and ^{56}Fe(p,n) reactions at E/sub p/ = 19 MeV. Absolute differential (p,n) cross sections were extracted for 1^+ states in ^{26}Al, ^{54}Co, and ^{56}Co, for the 0^+ isobaric analog state (IAS) in ^{54}Co and ^{56}Co, for a 2^+ state in each residual nucleus, and for the 0.199 MeV 7^+ state of ^{54}Co. No new experimental states were identified. Only relative cross sections were extracted at 0°. Experimental angle-integrated cross sections were obtained for all but one state. DWBA79 was used, with the G-matrix effective nucleon-nucleon interaction of Bertsch et al. (with the central triplet-odd component V/sub to/ = O) and the Livermore shell model wave functions to calculate differential (p,n) cross sections to 1^+ states and to the ^{54}Co and ^{56}Co IAS. Normalization of the DWBA angle-integrated cross sections to measurements for the ^{54}Co and ^{56}Co IAS (at E/sub p/ = 24.6 MeV) yielded the renormalized V/sub tau/ = 21.4 +- 2.1 MeV. Normalization of the DWBA angle-integrated cross sections to measurements for the 24.6 MeV ^{54}Co and ^{56}Co 1^+ states, coupled with the normalization of the wave functions to previously experimentally determined GT strength, yield the renormalized V/sub σtau/ = 12.3 +- 1.2 MeV. The experimental Gamow-Teller strength B(GT)/sub exp./ of the T = 1 ^{26}Al state at 9.44 MeV was found to be 0.69; B(GT)/sub exp/ of the T = 1 ^{26}Al state at 10.47 MeV was found to be 0.39.

6515 Nuclear Properties And Reactions, A=39-58, Theoretical

40709 (CEA-N—2406, pp 69-73) **Effects of two-particle two-hole excitations on the mass distributions in the ^{16}O + ^{40}Ca reaction.** Yamaji, S.; Tohyama, M. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

The mass distribution in the ^{16}O + ^{40}Ca collision at Esub(lab) = 157.3 MeV is calculated in the modified time-dependent Hartree-Fock theory which includes the effects of two-particle two-hole excitations. The obtained width of the mass distribution is the same order of magnitude as experimental data.

40710 (CEA-N—2406, pp 59-63) **Identification of an internal-wave contribution to inelastic scattering.** Dean, D.R.; Rowley, N. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

It is shown that the angular-momentum mismatch of an internal-wave contribution to inelastic scattering is greater than that of the barrier wave. The spin polarization of the residual nucleus will therefore be larger under conditions of moderate absorption. The system ^{40}Ca (α,α') ^{40}Ca (3^-, 3,73 MeV) at Esub(lab) = 49.5 MeV is discussed in detail, with particular emphasis on the observable consequences of this internal-wave contribution.

40711 (CEA-N—2406, pp 137-140) **Linearized Uehling-Uhlenbeck equation applied to high energy nuclear collisions.** Mies, S.; Schuermann, B. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

An expansion of the one-nucleon distribution function in terms of the number n of independent NN collisions is developed and thereby the Uehling-Uhlenbeck equation is recast in an infinite set of coupled integro-differential equations.

40712 (DOE/ER/05172—0019) **Reaction mechanism studies of heavy ion induced nuclear reactions. Annual progress report.** Mignerey, A.C. (Maryland Univ., College Park (USA). Dept. of Chemistry). Jul 1981. Contract AS05-76ER05172. 56p. (ORO—5172-0019). NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85014729.

The research summarized in this report was performed during the period August 1, 1980 to June 30, 1981. The experimental emphasis in the heavy-ion-induced reaction studies continues to be discrete charge and mass resolution of all projectile-like fragments measured. In an experiment performed at the Argonne National Laboratory Superconducting LINAC, the ^{37}Cl beam was used to bombard targets of ^{40}Ca and ^{209}Bi. This experiment is compared to results of our previous ^{56}Fe-induced experiments. Attempts were made to extend the ^{56}Fe reactions to lower energies at the Lawrence Berkeley Laboratory SuperHILAC. In a desire to improve the mass and charge resolution of previous experiments we tried a time-of-flight telescope employing both a channel-plate start and stop signal. This was backed by an ion chamber ΔE and silicon E detector. The operational difficulties encountered are being corrected and we hope to have a reliable system ready this fall. Studies of target fragmentation in ^{4}He-induced reactions are continuing via experiments and model calculations. The program which began at the University of Maryland Cyclotron has been continued at the Indiana University Cyclotron with 120 and 200 MeV ^{4}He incident on ^{13}C and ^{27}Al targets. While the Indiana data are currently being analyzed and no results are yet available, a summary of the Maryland work is given. Also presented in this section are the model calculations used to describe the data. 28 refs.

40713 (DOE/OR/00033—T104) **Single proton pickup reactions from ^{40}Ca and heavy ion detection techniques.** Bomar, G.L. (Oak Ridge Associated Universities, Inc., TN (USA)). Dec 1982. Contract AC05-76OR00033. 160p. NTIS, PC A08/MF A01; GPO Dep. File Number DE85015013.

Thesis. Submitted to Vanderbilt Univ., Nashville, TN.

Angular distributions of the ^{40}Ca(^{11}B,^{12}C)^{39}K, ^{40}Ca(^{10}B,^{11}C)^{39}K, and ^{40}Ca(^{14}C,^{15}N)^{39}K single proton pickup reactions have been measured at beam energies of 32, 31, and 40 MeV, respectively. The (^{11}B, ^{12}C) reaction has also been measured at 68 MeV. Angular distributions have been measured for transitions to the ^{39}K ground state have also been measured for all but the 32 MeV (^{11}B,^{12}C) reaction. Elastic scattering data has been taken at each of these energies for use in determination of optical model potential parameters. These optical model potentials have then been used to calculate the transfer reaction angular distributions using the Distorted Wave Born Approximation (DWBA). The success of the DWBA in describing each of these reactions as well as the anomalous ^{40}Ca(^{13}C,^{14}N)^{39}K reaction is discussed. The design and construction of a new "hybrid" detector is also discussed. This detector allows measurement of the total energy, energy loss, point of intersection with the focal plane, and the angle of incidence over a large portion of the focal plane. All of these parameters are measured in a single detector volume with no additional windows to degrade resolution. 52 refs., 43 figs.

40714 (INDC(CCP)—221/L, pp 22-28) **Differential cross-sections for neutron scattering by Fe nuclei over the 0.1-0.8 MeV energy range.** Sarkisov, A.A.; Martem'yanov, I.N.; Boguslovskij, A.M. Nov 1984. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781273.

Russian original distributed as INDC(CCP)-218/G.

In Translation of selected papers published in Nuclear Constants, Volume 3(52), Moscow 1983.

Experimental results concerning the angular distribution of neutrons scattered by iron are given for 9 energies between 0.1 and 0.8 MeV. Comparisons with optical model calculations are also shown.

40715 (INIS-SU—282, pp 181) **Spin-dependent effective NN interaction in niclei and M1 resonance excitation in the (p,p') reaction at E/sub p/ = 201 MeV.** Borzov, I.N.; Tolokonnikov, S.V.; Fayans, S.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40716 (INIS-SU—282, pp 245) **Clusters with mass numbers 5 <= X <= 16 in atomic nuclei.** Kurgalin, S.D.; Chuvil'skij, Yu.M. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40717 (LA—10368-T) **Spin excitations in ^{48}Ca and ^{90}Zr with 319 MeV protons.** Nanda, S.K. (Los Alamos National Lab., NM (USA)). May 1985. Contract W-7405-ENG-36. 216p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE85015364.

Cross sections, analyzing powers, and spin-flip probabilities have been measured in the low momentum transfer region in the ^{90}Zr(p vector, p' vector) ^{90}Zr* reaction at 319 MeV. A rich fine structure is observed for the first time in inelastic proton scattering in the previously proposed M1 giant resonance region. Angular distribution of most of these states are consistent with M1 excitation. The excitation energies of the fine structure states are in good agreement with similar structure seen in electron scattering; however, discrepancies in spin assignments remain. The measured cross section for the entire bump is about 37 +- 10% of the Distorted Wave Impulse Approximation (DWIA) prediction for the M1 strength in ^{90}Zr with simple wave functions. However, an analysis of the fine structure states reveals about 15% of the strength in the M1 region to be due to narrow El states; another 8% is attributed to M2 strength. The spin-flip measurements for ^{90}Zr reveal a large spin-flip probability value for the M1 region; good agreement is obtained with DWIA calculations. However, a large cross section for spin excitations distributed uniformly over the excitation energy region from about 7 to 25 MeV is observed for the first time. The spin excitation strength in this giant resonance continuum is found to about 0.80 mb/sr/MeV. Angular distributions for the spin-flip cross sections from 7 to 18 MeV in steps of 2 MeV have been analyzed with low multipole spin excitation calculations in the DWIA framework; the observed spin-flip strength in this region is found to be consistent with spin excitation involving angular momentum transfer of up to two. Finally, cross section, analyzing power, and spin-flip probability data have also been obtained for the 10.23 MeV M1 transition in the ^{48}Ca(p vector, p' vector)^{48}Ca* reaction at 319 MeV. The quenching of M1 strength in ^{48}Ca relative to theoretical predictions is found to be consistent with previous work.

6516 Nuclear Properties And Reactions, A=59-89, Theoretical

REFER ALSO TO CITATION(S) 40716

40718 (CEA-N—2406, pp 18-19) **Quasi-elastic neutron pick-up reactions induced by ^{18}O ions on nickel targets.** Durell, J.L.; Chapman, R.; Mo, J.N.; Woods, P.J.; Cunningham, R.A.; Fulton, B.R.; Sanderson, N.E. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

The (^{16}O, ^{19}O, ^{20}O, ^{21}O) reactions on targets of ^{61}Ni, ^{64}Ni have been studied at a laboratory bombarding energy of 150 MeV. The ^{19}O, ^{20}O, ^{21}O reaction products were detected using a large solid angle magnetic spectrometer and associated focal plane detector system. The absolute cross-sections for one, two and three neutron pick-up have been determined.

40719 (INIS-SU—282, pp 526) **Moessbauer study of local change in the magnetic moment of Fe atoms at introducing Re atoms into Fe sublattice of $DyFe_2$ intermetallic compound.** Pacheko Serrano, U.A.; Kazakova, E.F.; Rejman, S.I.; Ryasnyj, G.K.; Sorokin, A.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40720 (INIS-SU—282, pp 537) **Electron nuclear gamma resonance spectroscopy for studying mass transfer in solids.** Babikova, Yu.F.; Vakar, O.M.; Gruzin, P.L.; Petrikin, Yu.V. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40721 (PNL-SA—12858) **Delayed neutron data from TRISTAN.** Warner, R.A.; Reeder, P.L. (Pacific Northwest Labs., Richland, WA (USA)). Apr 1985. Contract AC06-76RL01830. 7p. (CONF-850507—34). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013040.

From International conference on nuclear data for basic and applied science; Santa Fe, NM, USA (13 May 1985).

Half-lives and P/sub n/ values are presented for 38 precursors among the low yield fission products. P/sub n/ values are based on a beta-neutron coincidence technique.

40722 **Ultralow-background study of neutrinoless double β decay of ^{76}Ge; new limit on the Majorana mass of ν/sub e/ .** Avignone F.T. III; Brodzinski, R.L.; Brown, D.P.; Evans J.C. Jr.; Hensley, W.K.; Miley, H.S.; Reeves, J.H.; Wogman, N.A. (Pacific Northwest Laboratory, Richland, Washington 99352 and University of South Carolina, Columbia, South Carolina 29208 XPNL-USC Collaboration)). *Physical Review Letters;* 54: No. 21, 2309-2312(27 May 1985). Contract AC06-76RL01830.

A lower limit of 1.16 x 10^{23} yr (1σ) is reported for the half-life of no-neutrino $\beta^-\beta^-$ decay of ^{76}Ge which results from 3763 h of counting with an ultralow-background, 135-cm^3 prototype detector located 1438 m underground. A limit of 1.7 x 10^{23} yr (1σ) results from the best combination of our data with that from other experiments. Straightforward application of shell-model matrix elements to this limit implies that <m/sub ν/> <3.2 eV (1σ).

6517 Nuclear Properties And Reactions, A=90-149, Theoretical

40723 (ANL/NDM—91) **Energy dependence of the optical model of neutron scattering from niobium.** Smith, A.B.; Guenther, P.T.; Lawson, R.D. (Argonne National Lab., IL (USA)). May 1985. Contract W-31-109-ENG-38. 28p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015234.

Neutron differential-elastic-scattering cross sections of niobium were measured from 1.5 to 10.0 MeV at intervals of $\leqq$200 keV below 4.0 MeV, and of $\approx$500 keV from 4.0 to 10.0 MeV. Ten to more than fifty differential-cross-section values were determined at each incident energy, distributed over the angular range $\approx$20 to 160°. The observed values were interpreted in the context of the spherical optical-statistical model. It was found that the volume integral of the real potential decreased with energy whereas the integral of the imaginary part increased. The energy dependence in both cases was consistent with a linear variation. There is a dispersion relationship between the real and imaginary potentials, and when this was used, in conjunction with the experimental imaginary potential, it was possible to predict the observed energy dependence of the real potential to a good degree of accuracy, thus supporting the consistency of the data and its analysis. The real-potential well depths needed to give the correct binding energies of the 2d/sub 5/2/, 3s/sub 1/2/, 2d/sub 3/2/ and 1g/sub 7/2/ particle states and of the 1g/sub 9/2/ hole state are in reasonable agreement with those given by a linear extrapolation of the scattering potential. However, the well depths needed to give the observed binding of the 2p/sub 3/2/, 1f/sub 5/2/ and 2p/sub 1/2/ hole states are about 10% less than the extrapolated values. 40 refs., 5 figs.

40724 (BNL-NCS—36554) **Heavy mass elements total half-lives for selected long-lived nuclides.** Holden, N.E. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 12p. (CONF-8506130—5). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014218.

From International Committee for Radionuclide Metrology meeting; Grenoble, France (3 Jun 1985).

In the past, many compilations and evaluations of half-lives have been made which have uncritically accepted authors' values and uncertainties. They have merely recommended weight-averaged reported results. This evaluation attempts to reanalyze each experiment in the literature including an estimate of the standard deviation utilizing, where possible, an estimate of the systematic error. This paper constitutes a preliminary step in the process of recommending values. The long-lived nuclides of heavy mass elements are of interest in determining geological ages using the Re-Os or the Lu-Hf dating methods, in supplying information on the p-process (proton capture) of nucleo-synthesis, in providing information on lepton number conservation and the rest mass for the electron neutrino from double β decay processes and in the case of tantalum because it represents the first long-lived state which is actually an isomer. Experimental data on the half-lives of selected nuclides have been evaluated and recommended values and uncertainties are presented for the following nuclides: ^{128}Te, ^{130}Te, ^{129}I, ^{138}La, /sup 144,145/Nd, /sup 146,147,148/Sm, ^{152}Gd, ^{154}Dy, ^{176}Lu, ^{174}Hf, ^{180}Ta, ^{187}Re, ^{186}Os, ^{190}Pt, /sup 204,205/Pb and /sup 230,232/Th. It is shown that ^{204}Pb, which was previously thought to be radioactive, is stable. For ^{205}Pb, the L electron capture x-rays have been revised for the M and higher x-ray yields. The resulting half-life for ^{205}Pb is 1.9 +- 0.3 x 10^7 years. ^{146}Sm with a half-life of 1.03 +- 0.05 x 10^8 years is the longest-lived extinct natural nuclide. 21 tabs.

40725 (CEA-N—2406, pp 49-53) **Analysis of fusion and deep-inelastic collisions of heavy ions with the extended surface friction model.** Froebrich, P. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

In this contribution is presented some further results of the extended surface friction model in order to demonstrate that this model is able to describe in a universal way data on fusion and deep-inelastic collisions of heavy ions. The model is an extension of the friction model by Gross and coworkers by including individual (quadrupole) deformation modes of the collision partners, by taking into account charge and mass transfer, and by treating statistical fluctuations in all relevant degrees of freedom. One essential feature of the model is that the friction acts between the juxtaposed surfaces of the collision partners. Measured cross sections are compared with the results of the surface friction model.

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40726 (CEA-N—2406, pp 106-110) **Exclusive measurements in incomplete fusion reactions of Sn with ^{16}O at 5.6, 6.2 and 7.8 MeV/A.** Gerschel, C.; Gillibert, A.; Perrin, N.; Tricoire, H. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Exclusive γ multiplicity measurements have been performed on ^{116}Sn and ^{124}Sn targets with ^{16}O beam at 90, 100 and 125 MeV. The entrance channel angular momentum has been determined. The whole incomplete fusion channel is found to follow the complete fusion channel with an increasing relative cross section as the beam energy increases.

40727 (CEA-N—2406, pp 101-105) **Competition between peripheral and central emission in incomplete fusion reactions.** Tricoire, H. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

In the frame of a classical model we show that the emission of fast particles in incomplete fusion reactions may occur either from a PEP emission which happens preferentially at low angular momenta or from an inertial emission with a maximum of the cross section located near the critical angular momentum for complete fusion. The competition of these mechanisms depends crucialy of the interaction between the particle to be emitted and the target nucleus. Numerical calculations are performed with various particle target potentials. Using a proximity potential, one gets results in good agreement with experimental data.

40728 (CRN-PN—84-28) **Behaviour of ^{144}Gd at very high angular momentum. Study of the continuum.** Nourreddine, A. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires; Strasbourg-1 Univ., 67 (France)). 1984. 137p. (In French). NTIS (US Sales Only), PC A07/MF A01. File Number DE85751939.

The specific physical concepts that dictated the choice of ^{144}Gd for the present high spin study are presented in the first part of this work. The second part describes the various formalisms and techniques used to extract the multiplicities, multipolarities and moments of inertia from continuous γ ray spectra. The third part relates the results of the quasi-continuum γ ray of ^{144}Gd formed in the fusion-evaporation reaction $^{120}Sn(^{28}Si, 4n\gamma)$ with four bombarding energies. A detailed balance of energy and angular momentum of the compound nucleus desexcitation has been given. Finally the evolution of the nuclear shape as a function of spin has been determined from the experimental data and interpreted by a combined micro and macroscopic theoretical calculations using a Woods-Saxon potential.

40729 (DOE/ER/10495—5) **Study of transitional nuclei at TRISTAN. Progress report.** Petry, R.F. (Oklahoma Univ., Norman (USA)). 1985. Contract AS05-79ER10495. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85012463.

The past year has been devoted to continued studies of the A ~ 100 region with new studies on the decay of ^{100}Sr and ^{103}Sr to examine the structure of odd-odd deformed nuclei in this region, and continuing studies of the odd-A nuclei in this region, particularly ^{101}Sr. In addition work on the decay of ^{145}Cs has been revived with the availability of an appropriate ion source. A significant effort was expended on the decay of ^{90}Sr.

40730 (GSI—85-13-Prepr.) **Gamma-spectroscopic investigations in the radiative-fusion reaction $^{90}Zr + ^{90}Zr$.** Schmidt, K.H.; Simon, R.S.; Keller, J.G.; Hessberger, F.P.; Muenzenberg, G.; Clerc, H.G.; Sahm, C.C.; Gollerthan, U.; Schwab, W. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). Feb 1985. 11p. (CONF-850173—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE85752011.

From 23. international winter meeting on nuclear physics; Bormio, Italy (21 Jan 1985).

In order to understand the nature of the radiative-fusion process, the emitted γ radiation was investigated in a recent experiment.

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40731 (GSI—85-14-Prepr.) **Structure effects in ^{238}U-induced dissipative collisions.** Mayer, W.; Beier, G.; Friese, J.; Henning, W.; Kienle, P.; Koerner, H.J.; Mayer, W.A.; Mueller, L.; Rosner, G.; Wagner, W. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). Feb 1985. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85752012.

A high resolution kinematic coincidence set-up using position sensitive gas detectors was developed to study ^{238}U - induced reactions on ^{110}Pd and ^{124}Sn targets between 5.70 and 6.02 MeV/u bombarding energies. Nuclear structure effects were observed in the distribution of binary reaction products possibly caused by enhanced multinucleon transfer matrix elements.

40732 (INDC(CCP)—229/L, pp 1-14) **Investigation of the mechanism of fast neutron scattering by even isotopes of molybdenum.** Korzh, I.A.; Lunev, V.P.; Mishchenko, V.A.; Mozhzhukhin, Eh.N.; Pravdivyj, N.M.; Sukhovitskij, E.Sh. Nov 1984. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781276.

Russian original distributed as INDC(CCP)-213/G.

In Translation of selected papers published in Nuclear Constants 1(50) 1983.

Experimental differential and integral cross-sections of elastic and inelastic scattering of neutrons by the isotopes ^{92}Mo and ^{94}Mo are given. The experimental data are analysed in the framework of the spherical optical model, of the coupled-channel method and also of up-to-date versions of the statistical theory of nuclear reactions. A theoretical analysis is used to determine the ratio of the contributions of the two scattering mechanisms, namely direct scattering and scattering through a compound nucleus.

40733 (INDC(CCP)—229/L, pp 15-45) **Evaluation of fast-neutron radiative capture cross-sections for samarium and europium odd isotopes.** Yurlov, B.D.; Belanova, T.S.; Ignatyuk, A.V.; Kononov, V.N.; Manturov, G.N. Nov 1984. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781276.

Russian original distributed as INDC(CCP)-213/G.

In Translation of selected papers published in Nuclear Constants 1(50) 1983.

Odd isotopes of samarium are among the first ten or so most important fission products responsible for reactor core poisoning. The odd isotopes of europium have a great potential as a material for reactor control rods. There is, however, a considerable spread of the data of neutron capture cross-sections for these two elements, and this prompted the present analysis and evaluation of this kind of data. A summary of existing experimental data is presented, and tables with evaluated parameters necessary to describe and extrapolate these data are given.

40734 (INIS-SU—282, pp 527) **Determination of a magnetic hyperfine field for sup(92m)Nb in $ZrFe_2$ using the oriented nuclear technique.** Erzinkyan, A.L.; Murav'eva, V.V.; Parfenova, V.P.; Turovtsev, V.V. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40735 (INIS-SU—282, pp 100) **Structure of excited states of tellurium even isotopes.** Alikov, B.A.; Erokhina, K.I.; Kuznichenko, A.V.; Lebedev, V.N.; Efimov, A.D.; Onishchenko, G.M.; Nazmitdinov, R.G. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40736 (INIS-SU—282, pp 150) **Low-lying dipole states of spherical nuclei.** Voronov, V.V.; Kkhoa, D.T.; Ponomarev, V.Yu. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-840419—Summ.).

From Environmental laws and regulations - introductory course; Washington, DC, USA (10 Apr 1984).

40737 (INIS-SU—282, pp 451) **Dipole photon strength functions of compound-compound γ-transitions and γ-spectra of neutron radiative capture.** Kadmenskij, S.G.; Lomachenkov, I.A.; Furman, V.I. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40738 (INIS-SU—282, pp 304) **Description of double differential cross sections of reactions with complex particles in a formalism of multistage direct processes with account for the coalescence mechanism.** Deb, A.K.; Zhivopistsev, F.A.; Kehbin, Eh.I.; Sukharevskij, V.G.; Kajmin, V.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40739 (INIS-SU—282, pp 432) **Analysis of inclusive spectra of particles from the processes of light ion fragmentation on nuclei at intermediate energies.** Evlanov, M.V.; Polozov, A.D.; Sokolov, A.M. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40740 (INIS-SU—282, pp 441) **Separable potentials for calculation of the cluster knock-out reactions by protons of intermediate energies.** Vdovin, A.I.; Golovin, A.V.; Loshchakov, I.I. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40741 (INIS-SU—282, pp 442) **Structure of differential cross section of diffraction nuclear processes.** Arushanov, G.G.; Ismatov, E.I.; Arushanov, V.G.; Kirson, I.M. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40742 (INIS-SU—282, pp 469) **Phenomenological parametrization of alpha-transfer form factors.** Omar, K.M.; Semenov, V.M.; Subbotin, V.B.; Gridnev, K.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40743 (INIS-SU—282, pp 90) **Relative K-capture probabilities for single-forbidden β transitions.** Begzhanov, R.B.; Azimov, K.Sh.; Magrupov, R.D.; Mirakhmedov, Sh.A.; Mukhammadiev, A.; Narzikulov, M.; Salimov, S.Kh. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40744 (JINR—D-7-83-644, pp 342-348) **Independent cross sections of alkali isotopes produced in various targets bombarded by ^{12}C and ^{16}O ions up to 77 MeV per nucleon.** Saint Simon, M.; Audi, G.; Ephepue, M.; Guimbal, P.; Haan, S.; Thibault, C.; Touchard, F.; Langevin, M.; Mueller, A.C. 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Preliminary investigation of the possibility of producing new isotopes, far from stability line, with heavy ion beams in the range of 20 to 100 MeV/nucleon is carried out. Isotopic distributions of Rb, Cs produced in the $^{12}C+^{181}Ta$ system and Rb produced in the $^{12}C+^{93}Nb$, $^{16}O+^{93}Nb$ and $^{12}C+^{238}U$ systems are given. It is concluded that different processes occurring in the collisions are observed: peripheral collisions with weak mass and energy transfers and central collisions leading to fission and fragmentation of the target or projectile nuclei.

40745 (JINR—D-7-83-644, pp 216-228) **Deep inelastic collisions of heavy ions and positron production at bombarding energies close to the Coulomb barrier.** Kienle, P. (Technische Univ. Muenchen (Germany, F.R.)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Deep inelastic collisions of heavy ions and positron production at bombarding energies close to the Coulomb barrier are discussed. $^{238}U+^{110}Pd$ and $^{238}U+^{124}Sn$ collisions at energies 5.7; 5.85 and 6.00 MeV which ranges between 4% and 11% above the Coulomb barrier are investigated. For the first time enhanced yields of pairs of product nuclei, indicating strong shell effects on the reaction mechanism in the whole bombarding energy range, are detected. A narrow positron line with an energy of about 300 keV is indicated.

40746 (KIYI—83-12, pp 4-6) **Nuclei and isomers production cross sections ratio in (p,xyz) reactions with Esub(p) = 72 MeV.** Vishnevskij, I.N.; Zheltonozhskij, V.A.; Lashko, T.N.; Trishin, V.V. 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781033.

In Nuclear and physical researches on the isochronous cyclotron U-240 during 1982.

The method of activation analysis has been used to determine yields of ground and isomeric nuclei states under 72 MeV proton irradiation of sup(110,111,112,114,116)Cd and sup(118,119,120)Sn in the (p, 3n) reaction. The data obtained point out increase of high-spin isomer yield with energy growth of incident particles.

40747 **Nuclear data sheets for A = 141.** Peker, L.K. (National Nuclear Data Center, Brookhaven National Laboratory, Upton, New York 11973). *Nuclear Data Sheets;* **45**: No. 1, 1-144(May 1985). Contract AC02-76CH00016.

The experimental nuclear structure data for A = 141 available through August 1984 have been reviewed. A summary of information obtained in various reaction and decay experiments is presented, together with adopted level schemes.

6518 Nuclear Properties And Reactions, A=150-189, Theoretical

REFER ALSO TO CITATION(S) 40725, 40847

40748 (CEA-N—2406, pp 29-35) **Investigation of some approximation used in promptly emitted particle models.** Leray, S.; La Rana, G.; Lucas, R.; Ngo, C.; Barranco, M.; Pi, M.; Vinas, X. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

We investigate three effects which can be taken into account in a model for promptly emitted particles: the Pauli blocking, the velocity of the window separating the two ions with respect to each of the fragments and the spatial extension of the window.

40749 (CEA-N—2406, pp 54-58) **What can we learn from spin depolarization measurements in damped nuclear reactions.** Steckmeyer, J.C.; Lefebvres, F. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

The angular momentum transfer into fragment spins has been studied in the damped nuclear reactions Ar+Bi at 255 MeV and 295 MeV and Ni+Pb at 435 MeV by measuring the fission fragment angular distribution of the heavy reaction product in coincidence with the light one. The data are compared with various theoretical models.

40750 (CEA-N—2406, pp 168-171) **"One dimensional" model for heavy ion reactions.** Scalia, A. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

This model allows to investigate the entrance channel effects in heavy-ion reactions.

40751 (CONF-8505172—2) **Partition of cross sections in asymmetric nucleus-nucleus reactions and the origin of fast alpha particles.** Siemssen, R.H. (Argonne National Lab., IL (USA); Rijksuniversiteit Groningen (Netherlands). Kernfysisch Versneller Inst.). 1985. Contract W-31-109-ENG-38. 22p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014989.

From Conference on nuclear structure with heavy ions; Legnaro, Padua, Italy (27 May 1985).

To investigate the mechanism of asymmetric nucleus-nucleus reactions from the Coulomb barrier to intermediate energies the $^{14}N + {}^{169}Tb$ reaction was studied at five bombarding energies between 8 and 23 MeV/u via particle-particle correlations (at selected energies) and particle KX-ray coincidences to identify the specific reaction channels. With the KX-ray method partial cross sections for projectile-like fragments (PLF) as a function of the atomic number (Z/sub res/) of the residual nucleus can be determined. The charge balance yields the "missing charge" dZ = Z/sub proj/ + Z/sub targ/ - Z/sub PLF/ - Z/sub TLF/ that indicates whether, in addition to the PLF, other charged particles are emitted. A large fraction of the inclusive cross sections is found to originate from such channels with two or more fragments in the exit channel, and this fraction increases as the PLF is further removed in mass from the incident projectile, and with increasing bombarding energy. From the particle-particle correlation studies it is found that sequential decays of PLF's are dominant. "Non-sequential" processes, if present, are associated with inelastic reactions involving excitations of both projectile and target. The bulk of the large alpha-particle cross section at small angles is found to be associated with channels in which, in addition to the alpha particle, only nucleons and other alpha particles are emitted. From γ-ray multiplicity measurements and from the broad distribution of the strength with Z/sub res/ it is concluded that these alpha particles originate from inelastic (damped) processes. 27 refs., 10 figs.

40752 (INIS-SU—282, pp 525) **Influence of the (n,γ) reaction-induced defects on hyperfine interaction of ^{181}Ta in YFe_2.** Bondar'kov, M.D.; Budzynski, M.; Sorokin, A.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40753 (INIS-SU—282, pp 121) **^{185}Eu quasiparticle-vibrational states.** Guseva, T.V.; Bondarenko, V.A.; Kramer, N.D.; Prokof'ev, P.T.; Tamberg, Yu.Ya. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40754 (INIS-SU—282, pp 126) **Prediction ability of the variable moment of inertia model with dynamic asymmetry.** Belen'kij, V.M.; Volmyanskij, Eh.I.; Grigor'ev, E.P. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40755 (INIS-SU—282, pp 135) **Energies of the ground-state band levels of ^{170}Er.** Belen'kij, V.M.; Grigor'ev, E.P.; Dadamukhamedov, T.D. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40756 (INIS-SU—282, pp 139-140) **Description of ^{173}Yb properties by means of the interacting boson model.** Kratsikova, T.I.; Davaa, S.; Finger, M.; Lipas, P.O.; Khammaren, E.; Toivonen, O. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40757 (INIS-SU—282, pp 151) **Description of E-l-transitions in odd deformed nuclei.** Nesterenko, V.O. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40758 (INIS-SU—282, pp 377) **Effect of giant dipole resonance pre-equilibrium decay on partial cross section ratio of phtonuclear reactions.** Goryachev, A.M.; Seliverstov, V.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40759 (INIS-SU—282, pp 387) **Description of nuclear reaction product spectra and excited nuclei temperature.** Karamyan, S.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40760 (INIS-SU—282, pp 136) **Excitation of the 5/2$^-$[523] band levels in the $^{171}Lu \rightarrow {}^{171}Yb$ decay.** Shestopalova, S.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40761 (INIS-SU—282, pp 380) **Study on reaction mechanism of incomplete fusion reactions; with reaction channel isolation on X-ray radiation of residual nuclei.** Kamanin, V.V.; Kugler, A.; Oganesyan, Yu.Ts.; Penionzhkevich, Yu.Eh.; Ryudiger, Yu. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40762 (JINR—D-7-83-644, pp 288-297) **Direct processes in heavy ion reactions.** Bunakov, V.E.; Zagrebaev, V.I. (AN SSSR, Leningrad. Inst. Yadernoj Fiziki). 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Direct processes in heavy ion reactions are investigated. Relative theoretical contributions in the inclusive spectrum of α particles on processes of stripping breakup and inelastic breakup are estimated using the $^{22}Ne + {}^{181}Ta$ reaction as an example. The consideration is performed taking into account Coulomb and nuclear distortions in the inlet and outlet ion channels. It is shown that the hard edge of α spectrum and its maximum are well described by peripheral direct processes. The hard spectrum edge is conditioned by the pure process of "incomplete fussion" bringing about the pro-

duction of a compound nucleus. The main part of inclusive spectrum is conditioned by reactions of inelastic and elastic breakup not connected with the production of a compound nucleus.

40763 (JINR—D-7-83-644, pp 381-388) **Heavy-ion induced fission reactions.** Britt, H.C.; Fowler, M.M.; Fraenkel, Z.; Gavron, A.; Plicht, J.; Wilhelmy, J.B. (Los Alamos National Lab., NM (USA)); Plasil, F.; Awes, T.; Young, G. (Oak Ridge National Lab., TN (USA)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Heavy-ion induced fission reactions are investigated. The problem of obtaining a representative set of fission-cross section data, so that it would be possible to test both the mass and angular momentum dependence of fission barriers in the mass region $150<A<210$, is discussed. A statistical model utilizing the barrier calculations of Sterk has been developed. Results on fission cross sections for Po, Os and Er isotopes produced and excited in a variety of heavy-ion reactions induced by projectiles from ^{9}Be through ^{64}Ni. The experimental data clearly show the qualitative effects of angular momentum, excitation energy and fissility on the fission cross section. They provide an ideal testing ground for theoretical models of fission in this mass region.

40764 (JINR—D-7-83-644, pp 102-113) **Masses of nuclides near the boundary of proton stability.** Novikov, Yu.N. (AN SSSR, Leningrad. Inst. Yadernoj Fiziki). 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Results of precision measurements of boundary energies of continuous positron spectra using a detector made of superpure germanium are presented. On the basis of these results and values of alpha-particle energies in alpha-decay chains, values of masses of "remote" nuclides are obtained in the range of mass numbers A--150-180. The boundary of proton stability of nuclides is experimentally identified for the first time, ^{175}Au, ^{176}Au, ^{177}Au, ^{169}Ir, ^{170}Ir, ^{171}Ir, ^{165}Re, ^{166}Re and, possibly, ^{161}Ta nuclei appear to be sources of proton radioactivity. It is shown that pair proton energy Δp rises in the course of approaching the boundary of proton stability, and its value for nuclides close to the boundary surpasses Δsub(p) value in the range of beta-stable pairs in a number of cases by 50%. Regularity in the change of Δsub(p) values in all cases investigated is noted.

6519 Nuclear Properties And Reactions, A=190-219, Theoretical

40765 (CEA-N—2406, pp 8-13) **Nearside-farside analyses of heavy-ion direct reactions to the continuum.** Dean, D.R.; Mosel, U.; Lenske, H.; Wolter, H.H. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Continuum multi-step direct-reaction theory is combined with a decomposition of the scattering amplitude into its nearside and farside components. Calculations are made for ^{16}O+^{48}Ti at Esub(lab) = 75 - 125 MeV and ^{16}O+^{208}Pb at Esub(lab) = 192 MeV. One- and two-step processes are considered, which enables a description of continuum cross sections and spin polarizations to be given for energy losses of up to 25 MeV. The increased importance of negative-angle scattering for large energy losses in some systems can be explained using these techniques. The effect of the strong Coulomb repulsion in heavy systems is considered. The method is quantum-mechanically based and the results justify the classical interpretation of Wilczynski plots.

40766 (CEA-N—2406, pp 36-39) **Fast light ejectiles as a probe of reaction mechanism. The important effect of decomposition into different sources.** Ingold, G.; Jahnke, U.; Thoma, G.; Homeyer, H.; Fuchs, H.; Buergel, M.; Hilscher, D. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Fast forward-emitted light particles, frequently considered as carrier of information on early reaction phases, are to a considerable fraction due to the trivial process of sequential emission from excited projectile-like fragments. A method is pointed out for an experimental separation of the sequential decay from the more interesting true preequilibrium emission. The method is based on a determination of the energy transferred to the target by counting of the evaporated neutrons. The application to the case of α-particles from ^{20}Ne+^{197}Au at 11, 15 and 20 MeV/nucleon indicates very similar yields, excitation functions and angular distributions for the two processes. The α-particle energy distributions, however, are very different for the two mechanisms and imply source parameters deviating significantly from those obtainable with fits to inclusive cross sections.

40767 (CEA-N—2406, pp 45-48) **Phase space model of angular distributions in heavy-ion-induced fission.** Rossner, H.H.; Huizenga, J.R.; Schroeder, W.U. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Heavy-ion induced fission reactions are analyzed in terms of a statistical scission model, in which fragment angular distributions are determined by the phase space available at the scission point. Excellent agreement between calculations and data is obtained, including reactions exceeding the liquid-drop limit of stability, in which cases the conventional transition-state model is inapplicable.

40768 (CEA-N—2406, pp 97-100) **Investigation of the Kr+Au system at 35 MeV/u: evidence for highly energy relaxed products.** Adloff, J.C.; Boishu, B.; Dalili, D. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

We present the first experimental results obtained by the Caen-Saclay-Strasbourg collaboration using the first 35 MeV/u Kr beam accelerated at GANIL. They show the existence, in addition to known mechanism like fragmentation, of highly energy relaxed products.

40769 (FRNC-TH—1920) **Measurement of photonuclear cross sections from 30 to 140 MeV for intermediate and heavy mass nuclei (Sn, Ce, Ta, Pb and U).** Lepretre, A. (Paris-11 Univ., 91 - Orsay (France)). Jun 1982. 309p. (In French). NTIS (US Sales Only), PC A14/MF A01. File Number DE85751937.

The total photonuclear absorption cross section for Sn, Ce, Ta, Pb and U has been studied from 25 to 140 MeV using a continuously variable monochromatic photon beam obtained from the annihilation in flight of monoenergetic positrons. The basic experimental results are a set of data giving sums of inclusive multiple photoneutron production cross sections of the form σsup(j) (Esub(γ) = Σsub(i=j)σ(γ,in) for neutron multiplicities ranging from j=1 to 12. From these data the total photonuclear absorption cross section σ(tot : Esub(γ)) has been deduced. It is concluded that Levinger's modified quasi-deuteron model describes the total cross sections reasonably well. When these data are combined with lower energy data and integrated to 140 MeV they indicate the need for an enhancement factor K for the Thomas-Reiche-Kuhn sum rule of 0.76 +- 0.10. No evidence was found that would indicate an A-dependence for the enhancement factor. From event-by-event records of observed photoneutron multiplicities it was also possible to determine the mean number of photoneutrons, antiν, for each photon energy and the widths W of the multiplicities distributions. From these measurements one also obtains the cross section

for the formation of a compound nucleus state excited with the full energy of the absorbed photon.

40770 **(IAE—3786/2) Contribution of collective freedom degrees to the one-particle matrix elements for near-magic nuclei.** Platonov, A.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1983. 27p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701810.

A general scheme for calculating contributions from low-lying collective excitations to one-particle matrix elements was constructed in the framework of self-consistent theory of the finite Fermi systems. The calculations were conducted as applied to isomer shifts as well as to probabilities of l-forbidden M1-transitions in the ^{209}Pb+- one quasiparticle nuclei: sup(207, 209)Pb, ^{209}Bi and ^{207}Tl. 23 references, 4 tables.

40771 (INIS-SU—282, pp 454) **Polarizability and deuteron disintegration in elastic scattering in electric field of heavy nuclei.** Verbitskij, V.P.; Terenetskij, K.O. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40772 (JINR—D-7-83-644, pp 477-488) **Some peculiarities of fission fragment mass distributions of preactinide nuclei.** Itkis, M.G.; Okolovich, V.N.; Smirenkin, G.N. (AN Kazakhskoj SSR, Alma-Ata. Inst. Yadernoj Fiziki). 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Investigations into mass and energy distributions of fission fragments of preactinide nuclei from ^{182}W to ^{209}Bi in the (α, f), (^{3}H, f), (^{12}C, f) and (^{16}O, f) reactions are presented. Results of studying mass distributions of fission fragments of nuclei are given. The dependence of width of mass distribution of fragments on excitation energy and nucleon composition of nuclei is presented. The effect of angular momentum on average parameters of mass and energy distributions of fragments is considered. The important role of the saddle point in the mechanism of formation of mass distribution of fission fragments of preactinide nuclei in a wide range of excitation energies and angular momenta, is noted. Asymmetric fission of preactinide nuclei is discussed.

40773 (JINR—D-7-83-644, pp 263-278) **Dynamical limitations to heavy ion fusion.** Back, B.B. (Argonne National Lab., Evanston, IL (USA)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Dynamical limitations to heavy ion fusion reactions are considered. The experimental signatures and the importance of a quasi-fission process are examined. The angular distributions of fission fragments for the ^{32}S+^{208}Pb and ^{16}O+^{238}U systems are presented. It is shown that the observations of quasi-fission for even rather "light" heavy ions possess severe limitations on the fusion process. This result may consequently be responsible for the lack of success of the search for super heavy elements in heavy ion fusion reactions.

40774 **Nuclear data sheets for A = 205.** Schmorak, M.R. (Oak Ridge National Laboratory, Oak Ridge, Tennessee, 37831). *Nuclear Data Sheets;* **45**: No. 1, 145-249(May 1985). Contract AC05-84OR21400.

The available experimental data pertaining to the nuclear structure of nuclei with A = 205 are compiled; the results from various decay and reaction measurements are compared and evaluated. Inconsistencies and discrepancies in the level schemes are discussed. The values of the r_0 parameter, used to calculate α HF, were obtained as in 72E121.

6520 Nuclear Properties And Reactions, A=220 And Above, Theoretical

REFER ALSO TO CITATION(S) 40754, 40767

40775 **(BNL-NCS—36379) Prompt neutron multiplicities for the transplutonium nuclides.** Holden, N.E.; Zucker, M.S. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 9p. (CONF-850507—35). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85013297.

From International conference on nuclear data for basic and applied science; Santa Fe, NM, USA (13 May 1985).

The direct determination of the average prompt neutron emission values is reviewed, and a method of comparing different sites of neutron emission multiplicity distribution values is described. Measured and recommended values are tabulated for these nuclides: ^{241}Am, ^{243}Am, ^{243}Cm, ^{243}Cm, ^{244}Cm, ^{246}Cm, ^{247}Cm, ^{249}Cm, ^{250}Cm, ^{245}Cm, ^{249}Bk, ^{246}Cf, ^{249}Cf, ^{250}Cf, ^{252}Cf, ^{254}Cf, ^{251}Cf, ^{253}Es, ^{254}Es, ^{244}Fm, ^{246}Fm, ^{255}Fm, ^{253}No, ^{254}Fm, ^{256}Fm, ^{257}Fm. 59 refs., 24 tabs. (LEW)

40776 (CEA-N—2406, pp 40-44) **Emission of light and energetic medium masses in multiparticle exit channels in the reactions ^{238}U+sup(nat)U and ^{238}U+Au at 16.7 MeV/N energy.** Khan, E.U.; Vater, P.; Brandt, R.; Khan, H.A.; Jamil, K.; Khan, N.A.; Sial, M.A. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Employing the 2π-geometry technique, two Solid State Nuclear Track Detectors (SSNTD) of different registration threshold have been used for studying the interaction of 16.7 MeV/N ^{238}U with sup(nat)U and Au targets. The abundant production of five-pronged fission events, together with other experimental results show the emission of considerable amount of light (4 < = m < = 30)u masses. Carrying almost the same specific energy as the projectiles, medium masses (52 < = m < = 84)u are also emitted making angles of about 15° with respect to the beam direction.

40777 (CEA-N—2406, pp 111-115) **Investigation of linear momentum transfer on the Ar + U system at 44 MeV/u.** Charvet, J.L.; Chiodelli, S.; Gregoire, C. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

We have measured the correlation angles between two fission fragments emitted in the reaction Ar + U at 44 MeV/u. The results indicate that, in the most cases, little linear momentum has been transferred to the fissioning nucleus. This is different from what has been observed with lighter projectiles in the same bombarding energy range. We also present inclusive measurements of charged particles detected at forward angles.

40778 **(EGG-M—12685) Nuclear decay data: some applications and needs.** Reich, C.W. (EG and G Idaho, Inc., Idaho Falls (USA)). 1985. Contract AC07-76ID01570. 13p. (CONF-850507—47). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014567.

From International conference on nuclear data for basic and applied science; Santa Fe, NM, USA (13 May 1985).

Nuclear decay data have broad relevance to a number of basic scientific disciplines as well as to many areas of technology. In this paper we discuss selected applications where decay data are making, or promise to make, important contributions. The following specific illustrations are discussed: the large body of precise new actinide-nuclide decay data produced through the work of the recently concluded IAEA Coordinated Research Program on the Measurement and Evaluation of Transactinium Isotope Nuclear Decay Data; the use of actinide-nuclide half-lives as reference standards in nuclear-data measurements; and the relevance of short-lived fission-product decay data to basic physics and reactor technology and some of the problems and challenges that they present to both theory and experiment.

40779 (INDC(CCP)—221/L, pp 29-36) **Investigation of emission neutron spectra for ^{235}U at incident neutron energy of 4.9 MeV.** Lovchikova, G.N.; Sal'nikov, O.A.; Somakov, S.P.; Sukhikh, S.Eh.; Polyakov, A.V.; Trufanov, A.M. Nov 1984. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781273.

Russian original distributed as INDC(CCP)-218/G.

In Translation of selected papers published in Nuclear Constants, Volume 3(52), Moscow 1983.

Measurements of neutrons (energy spectra, cross sections) produced after the bombardment of ^{235}U with 4.9 MeV neutrons are reported.

40780 (INDC(CCP)—222/L, pp 11-17) **Prompt neutron spectra for the energy range 10 keV - 3 MeV from ^{239}Pu and ^{233}U fission by thermal neutrons.** Lajtai, A.; Kechkemeti, J.; Shafar, J.; Khorany, M.; Kluge, D.; D'yachenko, P.P.; Piksajkin, V.M. Nov 1984. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781274.

Russian original distributed as INDC(CCP)-207/G.

In Translation of selected papers published in Nuclear Constants, Volume 2(51), Moscow 1983.

Energy spectra of prompt neutrons resulting from fission of ^{239}Pu and ^{233}U with thermal neutrons are determined experimentally in a wide energy range (10 keV - 3 MeV).

40781 (INDC(CCP)—229/L, pp 46-55) **Covariance matrix of experimental data on the energy dependence of ν-barsub(p) for neutron-induced fission of the nuclei ^{232}Th, ^{236}U, ^{238}U, ^{237}Np.** Malinovskij, V.V.; Kuz'minov, B.D.; Vorob'eva, V.G. Nov 1984. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781276.

Russian original distributed as INDC(CCP)-213/G.

In Translation of selected papers published in Nuclear Constants 1(50) 1983.

The article presents an evaluation of the error matrix in the measurement of the energy dependence of the average number of prompt neutrons in the fission induced by fast neutrons on the nuclei ^{232}Th, ^{236}U, ^{238}U and ^{237}Np.

40782 (INIS-SU—282, pp 363) **Determination of energy dependence on unresolved resonance density.** Ol'khovskij, V.S.; Senyuk, Yu.V. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40783 (JINR—D-7-83-644, pp 551-557) **From the search for superheavy elements in nature to the search for rare nuclear transmutations.** Ter-Akop'yan, G.M.; Sokol, E.A.; Chyong Fam Ngok; Flerov, G.N. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The problem of searching for superheavy elements (SHE) in nature is discussed. The data are presented on some most perspective methods which are applied or developed with this purpose. The greatest relative sensitivity of SHE detection is achieved due to neutron detectors. Using a neutron detector, the direct correlation between uranium content in Earth samples typical for mountain rocks of the Earth crust and the counting rate of events of spontaneous fission is established. For all samples studied the limit of SHE content is found $<1\text{-}3\times10^{-13}$ g/g. Using neutron detectors fixed in salt mine at the depth of 1100 m of water equivalent, samples of Saratov, Allende and Efremovka meteorites are also investigated. The upper limit of SHE content in samples, weighting about 10 kg at the counting rate of 10-15 neutron events a year, is 10^{-15} g/g in the supposition, that half-life period of SHE searched for is 10^9 years. The possibility of using a neutron detector in experiments on searching the decay of nucleon bound in the atomic nucleus is discussed in detail.

40784 (JINR—D-7-83-644, pp 405-419) **Fission barrier structure of nuclei in a region of thorium.** Pashkevich, V.V. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Fusion barrier structure of nuclei in the region of thorium is investigated. Calculations are performed in the framework of the Strutinsky method. Dependences of single-particle levels in the minimum of nucleus deformation energy for quadrupole and hexadecapole deformations on octupole deformation are presented. A good agreement of theory and experiment in greatly deformed isotopes is found. It is shown that the Strutinsky method has permitted to predict the presence of intermediate minimum on the surface of nucleus deformation energy in light isotopes in the rhodium-thorium region.

40785 (JINR—D-7-83-644, pp 431-440) **Rapid disappearance of shell effects in the fission of transfermium nuclei.** Hulet, E.K. (Lawrence Berkeley Lab., CA (USA)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The fission of transfermium nuclei is investigated. Spontaneous fission (SF) of ^{259}Md and ^{260}[104] is discussed. Mass distributions from SF and total-kinetic-energy distributions for SF of ^{259}Md and ^{260}[104] are given. The obtained symmetric mass distributions for ^{260}[104] and ^{259}Md are not in accord with the predictions from an adiabatic approach to fission as calculated from the two-center shell model. The SF properties of ^{260}[104] and ^{259}Md agree well with those expected from passage through a single liquid-drop barrier.

40786 (JINR—D-7-83-644, pp 441-448) **Dissipative phenomena and kinetic energy, mass and charge equilibration in fission.** Pomorski, K. (Uniwersytet Marii Curie-Sklodowskiej, Lublin (Poland). Inst. Fizyki). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Some problems related to the description of the fission of a nucleus are discussed. Calculations are carried out for the ^{236}U nucleus. The relative distance between centers of fission fragments, the mass of the heavy fission fragment and its nentron excess are used as collective variables. The mass, energy and charge variances are calculated as functions of collective variables. It is shown that for the investigation of fission improvements in the solution techniques of the Fokker-Planck equation are necessary.

40787 (JINR—D-7-83-644, pp 9-20) **Respectives of heavy ion physics in JINR.** Flerov, G.N. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Perspectives of heavy ion physics in JINR are discussed. The main attention is paid to directions that are connected with the application of intensive beams of U-400 cyclotron. Experiments into studying stability limits of heavy atomic nuclei are considered. The possibility of using beams of heavy ions in applied fields, particularly for the production of very thin nuclear filters is noted. Prospects of synthesis of superheavy elements (SHE) and SHE search in nature are also considered. The data on the events of spontaneous fission found in meteorite and hydrotherms and the data on lengths of tracks in olivines from meteorite prove the possibility of obtaining evidences of SHE existence in nature.

40788 (JINR—D-7-83-644, pp 21-40) **Recent findings on the road to the limits of fusion.** Armbruster, P. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The problem of existence of the limits of fusion is considered. The reasons preventing the production of a certain nucleus is classified in three categories: the ground state stability, the entrance channel restrictions and the exit channel restrictions. The discovery of the element 109 and the search for the element 116 are discussed in detail.

40789 (JINR—D-7-83-644, pp 41-54) **Recent attempts to produce superheavy elements by the $^{48}Ca+^{248}Cm$ reaction.** Gaggeler, H.; Bruchle, W.; Brugger, M. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The problem on the production of superheavy elements in the $^{48}Ca+^{248}Cm$ reaction is considered. Limitations for cold fusion are discussed. The cross section limits for the production of spontaneously-fissioning, long-lived superheavy elements 108 through 116 as it results from experiments are given. It draws attention to the high pUrity of the superheavy element chemistry in the experiment with any actinides.

40790 (JINR—D-7-83-644, pp 518-525) **Synthesis of heavy and superheavy elements via inertial confinement of uranium matter.** PetrascU, M. (Institutul de Fizica si Inginerie Nucleara, Bucharest (Romania)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

An outline of the mechanism for nuclear synthesis in confined uranium matter is presented. Conditions to perform fission chain reactions in milligrams ^{235}U are shown. Technical possibilities to reach conditions for inertial confinement of uranium, by using concentric proton beams, incident on a multilayer uranium pellet, were analyzed. The principle of acceleration of macroparticles of uranium with mass approximately 1g to velocities close to 10^6 cm/s is illustrated. The princiiple of acceleration is the following: the large current from a homopolar generator produces a magnetic field between the rails, and the magnetic field is interacting with the current flowing in the armature which in this case is an arc. The resulting Lorentz force accelerates the arc together with the projectile along the rails. The impact of two uranium projectiles is considered.

40791 (JINR—D-7-83-644, pp 589-595) **Measurement of alpha decay rare events in experiments on synthesis of far transfermium elements.** Kharitonov, Yu.P.; Rykhlyuk, A.V.; Konstantinesku, O.; Korotkin, Yu.S.; Ehsteves, Kh.; Oganesyan, Yu.Ts. (Joint Inst. for Nuclear Research, Dubna (USSR)); Yussonua, M. (CEA, 75 - Paris (France)); Brukhertzajfer, Kh. (Karl-Marx-Universitaet, Leipzig (German Democratic Republic). Sektion Physik). 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The possibility of radiochemical technique for the measurement of alpha decay of rare events in experiments synthesis of far transfermium elements is studied. The radiochemical method is applied to separate a long-lived α-active isotope. In the case of α decay of $^{266}109$, $^{262}107$, $^{258}105$ isotopes long-lived ^{246}Cf is produced. α-spectra of Cof fractions separated from ^{209}Bi and ^{208}Pb irradiation products are presented. A peak with the energy of 6.75 MeV detected in spectra. The data of experiments are used to determine the half-life period which coincides with ^{246}Cf period, i.e. 36 hours. Decays with the energy of 6.75 MeV in the $^{209}Bi+^{58}Fe$ reaction with the integral flux on 3 x 10^8 particles for the first 70 hours of measuring californium fraction have not been observed.

40792 (KIYI—83-12, pp 6-11) **Study on probability of the actinide nuclei fission by 40-80 MeV α-particles.** Zaika, N.I.; Kibkalo, Yu.V.; Tokarev, V.P.; Shityuk, V.A. 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781033.

In Nuclear and physical researches on the isochronous cyclotron U-240 during 1982.

Differential and integral cross sections of uranium-235 and uranium-236 nuclei fission by 40-80 MeV α-particles at the step approximately 10 MeV are measured and analyzed. Energy dependence of the value of distribution dispersion of fissile nucleus transient states by projections of total angular momentum K_0^2 is obtained from experimental data on angular anisotropy of fission. These data are compared with model calculations.

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40793 (AD-A—152763/9/XAB) **Numerical study of the mean-trajectory approximation in a nonadiabatic process. Annual technical report.** Sawada, S.; Metiu, H. (California Univ., Santa Barbara (USA). Dept. of Chemistry). Mar 1985. 63p. (TR—18). NTIS, PC A04/MF A01.

Numerical results obtained with the mean trajectory approximation applied to a nonadiabatic process described by a curve-crossing model are presented. These results are compared to the results given by the customary trajectory approximation, which uses one adiabatic potential to generate the nuclear motion, and to the results given by Nikitin's formula. It was found that at low kinetic energy the three procedures give very different results. The differences are caused by the fact that the mean-trajectory method includes a quantum effect in the effective potential used for the classical motion. Also discovered was an unexpected behavior: under certain conditions the transition probability seems to become a random function of the incident energy.

40794 (AERE-R—11515) **CADE - A computer programme for the calculation of nuclear cross-sections from the Weisskopf-Ewing theory.** Wilmore, D. (UKAEA Atomic Energy Research Establishment, Harwell. Theoretical Physics Div.). Dec 1984. 22p. HMSO, London, price Pound 4.00.

A computer programme which performs compound nucleus calculations using the Weisskopf-Ewing formalism is described. The programme will calculate the cross-sections for multi-particle emission by treating the process as a series of stages in the cascade. The relevant compound nucleus absorption cross-sections for particle channels are calculated with built-in optical model routines, and gamma ray emission is described by the giant dipole resonance formalism. Several choices for the final nucleus level density formula may be made using the level density routine contained in the programme. The total cross-section for the emission of a particle at any particular stage, is calculated together with the cross-section as a function of energy. The probability of leaving the final nucleus in a state of any particular energy is also obtained.

40795 (BNL—36620) **Can antibaryons signal the formation of a quark-gluon plasma.** Heinz, U.; Subramanian, P.R.; Greiner, W. (Brookhaven National Lab., Upton, NY (USA); Frankfurt Univ. (Germany, F.R.). Inst. fuer Theoretische Physik). 1985. Contract AC02-76CH00016. 13p. (CONF-8504152—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012262.

From Workshop on experiments for RHIC; Upton, NY, USA (15 Apr 1985).

We report on recent work which indicates that an enhancement of antibaryons produced in the hadronization phase transition can signal the existence of a transient quark-gluon plasma phase formed in a heavy-ion collision. The basis of the enhancement mechanism is the realization that antiquark densities are typically a factor 3 higher in the quark-gluon plasma phase than in hadronic matter at the same temperature and baryon density. The signal is improved by studying larger clusters of antimatter, i.e., light antinuclei like anti α, in the central rapidity region. The effects of the transition dynamics and of the first order nature of the phase transition on the hadronization process are discussed.

40796 (BNL—36655) **K meson-nucleus interactions: strangeness and nuclear matter.** Kahana, S. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 16p. (CONF-850634—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014229.

From International school for intermediate energy nuclear physics; Veronna, Italy (20 Jun 1985).

A brief review is provided of some straightforward K-nuclear and Λ-hypernuclear systems. A discussion of less straightforward speculations on H-dibaryons and strange quark matter by many authors, is also given. 28 refs., 6 figs.

40797 (CEA-N—2406, pp 13-17) **Transfer and excitations in grazing heavy ion reactions.** Werner, K.; Dietrich, K. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Expanding the determinant state of the TDHF theory in terms of basis functions involving the single particle states of separate nuclei and introducing certain statistical assumptions we derive closed formulas for the transfer and excitation probabilities. They depend on two parameters: the mean excitation energy z and the ratio q of the one nucleon transfer probability and the probability of a 1p-1h excitation. We obtain q and z by a fit to the experimental mass distribution and to the slope of the quasi-elastic cross section (at given scattering angle) in the inelastic channels .q is found to be close to 1. With these values of q and z, the calculated cross section exhibits resonance-like structures which are similar to the ones found experimentally. Preliminary calculations within TDHF also lead to large values of q.

40798 (CEA-N—2406, pp 20-23) **Fission of light nuclei with high angular momentum.** Nemeth, J.; Irvine, J.M.; Okolovicz, J. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

The fission of light nuclei is studied in an extended TDHF approximation with rotational constraint. It was found, that nuclei with mass number approximately 120-140 can fission if they have high angular momentum (L approximately 30-40 h). In the case of proton induced fission high energy (approximately 500 MeV) is needed to transfer such high angular momentum to the nucleus.

40799 (CEA-N—2406, pp 74-78) **Diffractive, diffusive and statistical aspects of deep-inelastic collisions in a parametrized S-matrix model.** Dean, D.R.; Lee, S.Y.; McGrath, R.L. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Deep-inelastic collisions are studied phenomenologically using a parametrized S-matrix approach. A statistical argument is used to demonstrate how the observed cross section is built up from different diffractive contributions, each with its own weight. The weight function is derived. The possibility of non-zero angular-momentum transfer is allowed for and it is shown that the spin polarization is particularly sensitive to the treatment of the Poisson sum. The spin alignment is considered and shown to be angle independent in the absence of statistical fluctuations.

40800 (CEA-N—2406, pp 83-86) **New phenomenological approach in treating fusion excitation functions.** Porto, F.; Sambataro, S. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

A new parametrization is proposed which allows us to draw a phenomenological formula able to reproduce the fusion excitation function for a wide range of colliding nuclei.

40801 (CEA-N—2406, pp 91-96) **Dynamical fusion barriers.** Dalili, D.; Lucas, R.; Ngo, C.; Suomijarvi, T.; Tomasi, E. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

We describe a phenomenological model which allows to compute fusion cross sections, for all combinations of projectiles and targets, at energies above the fusion threshold. The dynamical fusion barriers, which are an out-come of the model, are shown to be in many cases equal to the static fusion barriers. When not, the difference between these two quantities, which is called the dynamical energy surplus, is investigated as a function of different macroscopic parameters.

40802 (CEA-N—2406, pp 126-130) **Semiclassical description of hot nuclear systems.** Brack, M. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

We present semiclassical density variational calculations for highly excited nuclear systems. We employ the newly derived functionals tau[rho] and sigma[rho] of the extended Thomas-Fermi (ETF) model, generalized to finite temperatures. Excellent agreement is reached with Hartree-Fock (HF) results. We also calculated the fission barrier of ^{240}Pu as a function of the nuclear temperature.

40803 (CEA-N—2406, pp 131-133) **Investigation of the dynamics of ternary fission for the system ^{238}U + ^{238}U.** Xi-Zhen Wu; Maruhn, J.A.; Greiner, W. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

With the three center model we have studied the dynamics of ternary fission for the system ^{238}U + ^{238}U by solving the one-dimensional collective Schroedinger equation with the potential energy surface given by the liquid-drop model and the mass parameters given by the Werner-Wheeler method.

40804 (CEA-N—2406, pp 141-145) **Single-particle basis in an approximate treatment of the extended time-dependent Hartree-Fock theory.** Tohyama, M. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

The single-particle basis that can be used in the extended time-dependent Hartree-Fock theory is studied in a simple one-dimensional collision model. It is shown that the conventional set of single-particle states, which are boosted initially with the velocity of the collision, can be used.

40805 (CEA-N—2406, pp 154-156) **Elastoplasticity tensor for nucleus-nucleus collisions.** Lukasiak, A.; Noerenberg, W. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Within the framework of dissipative diabatic dynamics (DDD) the elastoplasticity tensor has been calculated for central nucleus-nucleus collisions. Results for ^{92}Mo+^{92}Mo are presented for three collective variables at various temperatures.

40806 (CEA-N—2406, pp 157-161) **New classical model for heavy ion reactions.** Smith, M.; Sperber, D.; Stryjewski, J.; Zielinska-Pfabe, M. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

A classical hydrodynamical model with the inclusion of collective shape deformations is used to explore the mechanism of heavy ion collisions.

40807 (CEA-N—2406, pp 146-149) **Realistic effective interaction for nucleus - Nucleus collision.** Basu, D.N.; Chaudhuri, A.K.; Sinha, B.C. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

The exchange effect for nucleus-nucleus potential has been computed by folding in the density matrices with a finite range effective interaction, using M3Y and Paris potential. The "effective" exchange interaction is both density and energy dependent. The potential agrees closely with phenomenology.

40808 (CEA-N—2406, pp 172-178) **Complete statistical treatment of heavy target fragmentation in high energy proton nucleus collisions.** Sa Ban Hao. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

An equilibrium statistical model of nuclear fragmentation in high energy proton-nucleon reactions is performed by Monte Carlo simulation. The fragment mass-yield distributions are visually well reproduced.

40809 (IAEA-SMR—93, pp 57-62) **New level density formula for arbitrary single particle level density by number theoretical methods.** Anzaldo Meneses, A.M. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R.). Apr 1984. NTIS (US Sales Only), PC A15/MF A01. File Number DE85781405. (CONF-820163—Pt.1).

From Winter college on nuclear physics and reactors; Trieste, Italy (25 Jan 1982).

The nuclear level density problem has been treated using modern methods of analytical number theory. In particular the asymptotical calculation of the partition function leads to more rigorous and more general results than the usual Bethe-formula. The partition function is expressed with the help of a Dirichlet series. The parameters of this series determine the obtained level density. For the case of constant single particle level density the resulting parameters yield the usual Bethe-formula. In general the parameters lead to another energy and nucleon number dependence of the level densities. They correspond to more general single particle level densities which include the shell structure. Also the BCS type of pairing has been taken into account.

40810 (INIS-mf—9311, pp 355-365) **Lifetime of hypernuclei.** Dabrowski, J. (Institute for Nuclear Studies, Warsaw (Poland)). 1984. NTIS (US Sales Only), PC A21/MF A01. File Number DE85781453. (CONF-8404243—).

From Workshop on the future of intermediate energy physics in Europe; Freiburg im Breisgau, F.R. Germany (10 Apr 1984).

The author discusses the decays of hypernuclei caused by the hadronic decay of hyperons inside the nucleus.

40811 (INIS-SU—282, pp 155) **Effective noncoulomb charge-dependent forces in atomic nuclei.** Kasymbalinov, R.N.; Sapershtejn, Eh.E. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40812 (INIS-SU—282, pp 172) **Correlations in ground states of even-even deformed nuclei.** Bastrukov, S.I.; Nesterenko, V.O. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40813 (INIS-SU—282, pp 174) **Effect of hexadecapole nuclear deformation on the giant quadrupole resonance excitation.** Sinichkin, V.P.; Shekhter, D.Sh.; Shekhter, L.Sh. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40814 (INIS-SU—282, pp 183) **Green function and density matrix for superfluid nuclei in a coordinate representation.** Smirnov, A.V.; Tolokonnikov, S.V.; Fayans, S.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40815 (INIS-SU—282, pp 184) **Pairing in atomic nuclei and nucleon-phonon interaction.** Gatilov, A.M.; Kadmenskij, S.G.; Luk'yanovich, P.A.; Remezov, Yu.I. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40816 (INIS-SU—282, pp 191) **Amplification of P and T effects in atomic nuclei.** Sushkov, O.P.; Flambaum, V.V.; Khriplovich, I.B. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40817 (INIS-SU—282, pp 201) **Accounting for a static deformation of the Fermi surface an determination of equilibrium characteristics of nuclei.** Kolomiets, V.M.; Tsekhmistrenko, I.Yu. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40818 (INIS-SU—282, pp 202) **Hydrodynamic fluctuations in nuclei.** Kolomiets, V.M.; Tsekhmistrenko, I.Yu. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40819 (INIS-SU—282, pp 230) **Interacting boson model in a SU(3) basis.** Guseva, I.S.; Smirnov, Yu.F.; Kharitonov, Yu.I. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40820 (INIS-SU—282, pp 237) **Nuclear sizes and optimal mass formula.** Kolesnikov, N.N.; Badaev, O.P.; Starosotnikov, M.I.; Vymyatnin, V.M. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40821 (INIS-SU—282, pp 240) **Calculation of the Weizsaecker formula coefficients on the basis of internucleon forces.** Krutov, V.A.; Krutova, L.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40822 (INIS-SU—282, pp 252) **Excitation of quantum systems by electrons in a magnetic field.** Batkin, I.S.; Berkman, M.I. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40823 (INIS-SU—282, pp 458-459) **Basic kinetic equation for nuclear systems.** Isaev, P.N. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40824 (INIS-SU—282, pp 470) **Cluster degrees of freedom of nucleus and models with preliminarily formed clusters.** Kadmenskij, V.G.; Kadmenskij, S.G. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40825 (INIS-SU—282, pp 471) **Atomic nucleus as a cluster system.** Kadmenskij, V.G.; Kadmenskij, S.G. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40826 (INIS-SU—282, pp 473) **Population of magnetic substates in coulomb excitation of nuclei by heavy ions.** Aleshin, V.P.; Ofengenden, S.R. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40827 (INIS-SU—282, pp 477) **Soliton solutions of nuclear hydrodynamic equations with Skyrme forces.** Kartavenko, V.C. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40828 (INIS-SU—282, pp 448) **New formulation of the N-D equations with account for inelastic channels contribution.** Safronov, A.N. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40829 (INIS-SU—282, pp 262-461) **Pauli repulsion in heavy ion inelastic scattering.** Bragin, V.N.; Chulkov, L.V. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40830 (INIS-SU—282, pp 472) **Energy and angular distributions in deep inelastic collisons of heavy ions.** Vydrug-Vlasenko, S.M.; Konstantinov, B.D. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40831 (INIS-SU—282, pp 473) **Elastic scattering of compound nuclei.** Dzholos, R.V.; Delchev, Ya.; Permyakov, V.P. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40832 (INIS-SU—282, pp 475) **Spin effects in the charge-exchange reactions with relativistic ions.** Kaptar', L.P.; Titov, A.I. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40833 (INIS-SU—282, pp 476) **Analysis of direct nuclear reactions with heavy ions in the framework of classical trajectory approximation.** Zagrebaev, V.I. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40834 (INIS-SU—282, pp 479) **Nonlinear effects in heavy ion scattering by nuclei.** Ivanov, A.G.; Gridnev, K.A.; Semenov, V.M.; Subbotin, V.B.; Khefter, Eh.F. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40835 (INIS-SU—282, pp 480) **Initial stage of heavy ion interaction and mechanism of kinetic energy dissipation.** Dzholos, R.V.; Ivanova, S.P.; Ivanov, V.V. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40836 (INIS-SU—282, pp 481) **Angular distributions and mechanism of some-nucleon transfer reactions induced by heavy ions in near-barrier range.** Dzhamalov, P.O.; Mukhamedzhanov, A.M. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40837 (INIS-SU—282, pp 487) **Excitation of arbitrary spin nuclei by neutrino and the structure of weak hadron neutral current.** Kerimov, B.K.; Agalarov, A.Z. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40838 (INIS-SU—282, pp 430) **Effect of angular momentum on fission product distribution in heavy ion reactions.** Adeev, G.D.; Gonchar, I.I.; Marchenko, L.A. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40839 (INIS-SU—282, pp 478) **New thermodynamical approach to nucleus fission.** Grashin, A.F.; Efimenko, A.D.; Kolobashkin, V.M. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40840 (JINR—D-7-83-644, pp 182-201) **Fragmentation of simple nuclear excitations.** Solov'ev, V.G. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The main ideas of the nucleus quasiparticle-phonon model (QPM) are presented, as well as its comparison with other models. Advantages of the above model are shown. Experimental data on fragmentation of deep hole and two-quasiparticle states in spheric nuclei are reviewed. Fragmentation of these states in the framework of QPM is described. Results of calculations are compared with experimental data. A condition with giant resonances is given. Fragmentation of collective states is considered using the example

of giant dipole resonance in sup(140,142)Ce and giant isoscalar quadrupole resonance in ^{208}Pb. Fragmentation peculiarities of charge-exchange collectiVe states in spheric and deformed nuclei are discussed. It is shown that in the framework of QPM energy centroids and widths of giant resonances are well described in the framework of QPM. The interaction of quasiparticles with phonons is responsible for the fragmentation of single particle and collective states in atomic nuclei.

40841 (JINR—D-7-83-644, pp 202-215) **Quadrupole collective excitations in rapidly rotating nuclei.** Mikhajlov, I.N. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The spectrum of collective quadrupole excitations in nuclei is investigated. The average nucleus field has the axial symmetry and rotation occurs relatively to this axis. Dependences of the spectrum of quadrupole oscillations on rotation rate for classic liquid drop (CLD) and for a drop of fermi-liquid (DFL) with fissionability parameter X=0.62 (^{154}Er) are presented. The dependence of probabilities of E2-transitions between single-phonon and phonon-free states on rotation rate for CLD and DFL with fussionability parameter X=0.62 (^{154}Er) is also presented. It is shown that for CLD collective E2-transition of states of yrast-consequence is absolutely forbidden. For DFL transitions are possible that lead to decay of phonon-free state with the excitation of phonons of γ-modes and decrease of angular momentum.

40842 (JINR—D-7-83-644, pp 229-250) **Dissipative diabatic dynamics: a shell-model approach to large-amplitude collective nuclear motion.** Norenberg, W. (Technische Hochschule Darmstadt (Germany, F.R.). Inst. fuer Kernphysik). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The aim of this paper is to describe the basic concept of dissipative diabatic dynamics (DDD) as a semiclassical generalization of giant vibrations to large amplitudes. The elastoplastic response of nuclear matter described by DDD is put in perspective to other types of the nuclear response within a phase diagram of nuclear dynamics. Results on diabatic single-particle states, potentials and masses obtained from a two-center shell model are discussed. The analysis of time-dependent Hartree-Fock theory calculations for a nucleus-nucleus collision indicate that the diabatic motion is a good approximation. Finger prints from the diabatic nuclear response are discussed for cross sections of nucleus-nucleus collisions, in particular for the preequilibrium emission of neutrons.

40843 (JINR—D-7-83-644, pp 259-262) **Liquid-particle model for nuclear dynamics.** Strutinsky, V.; Magner, A. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij); Brack, M. (Regensburg Univ. (Germany, F.R.)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The liquid-particle model for nuclear dynamics is discussed. Combined liquid-quantum dynamics is described. In solving the dynamic problem the nuclear surface as a dynamic variable is introduced. The giant zeroth-sound resonances are studied.

40844 (JINR—D-7-83-644, pp 251-258) **Nuclear-nucleus collisions: intrinsic motion with external correlations.** Munchow, L.; Pfitzner, A. (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Nucleus-nucleus collision, its intrinsic motion with external correlations are discussed. A consistent treatment of collective and intrinsic motion allows to include external correlations beyond the mean field approach. These correlations represent fluctuations of the external mean field. These fluctuations change the occupation numbers of the single-particle states and must be considered together with the two-body collisions. Equilibration and relative motion are intimately connected because the collision term becomes operative, via the time-dependence of the external mean field.

40845 (JINR—D-7-83-644, pp 310-318) **Escape of light charged particles and interaction of heavy ions with nuclei.** Volkov, V.V. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Some aspects of interaction of two-compound nuclei manifesting themselves in the emission of light charged particles, primarily α-particles, are considered. The consideration embraces deep inelastic collisions and collisions with partial dissipation of kinetic energy for energies of bombarding ions lower than 10 MeV/nucleon. The main attention is paid to the mechanism of production of nonequilibrium α-particles due to multinucleon transfers. In these reactions α-particle is produced due to transfer of all nucleons of colliding nucleus, except 4 nucleons of 1 s shell which form the flying-out α-particle to the target nucleus. The attention is paid to shell effects in reactjons of deep inelastic transfers and a special role of α-cluster configuration of a binary nuclear system in the case of its evolution to complete fusion.

40846 (JINR—D-7-83-644, pp 332-341) **Kinematic consideration of reactions of tangential interaction as a method of an analysis of experimental data.** Tarantin, N.I. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

In the framework of the kinematic method experimental data on reactions of tangential interaction of two complex nuclei are analyzed. The foundations of kinematic consideration of tangential interaction of two complex nuclei are given. Multiplicity dependences of γ-quanta on the mass ratio and kinetic energy of reaction products of nucleon transfer are discussed. Polarization of nucleon transfer reaction products is studied. Kinematic limits for nonequilibrium α-particles emitted due to evolution and decay of the binary nuclear system are considered in detail, as well as conditions for superfluid transfer of nucleon pairs in the case of collision of two nuclei of superfluid type.

40847 (JINR—D-7-83-644, pp 349-353) **Gasdynamic model of intermediate energy heavy ion collisions and high-energy particle emission.** D'yachenko, A.T.; Rubchenya, V.A.; Ehjsmont, V.P. (Radievyj Inst., Leningrad (USSR)). 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Emission of high-energy particles is investigated for cases of collision of heavy ions of intermediate energies in the framework of gasdynamic model. Nonequilibrium equation of state corresponding to fermi-ellipsoid is used in calculations. In the process of collision the smaller nucleus makes "a tube of nuclear matter" in the target nucleus. The process of nucleus colllision with the tube is performed in two stages: initial compression and the following relaxation. Results of calculations of compression degree on the collision energy for nucleon are presented, as well as maximum velocity in the process of system expansion for Brakner interaction and Skyrme interactiion. Spectra of neutrons in the ^{12}C+^{158}Gd reaction and proton spectra in the ^{16}O+^{197}Au reaction are calculated.

40848 (JINR—D-7-83-644, pp 354-370) **Multifragmentation of heavy nuclei.** Bondorf, Ya. (Niels Bohr Inst., Copenhagen (Denmark)); Mishustin, I.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii); Pesik, K. (Nordic Co-ordination Committee for Atomic Energy, Risoe (Denmark)). 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

A statistic model is developed for the description of the breakup process of excited heavy nuclei. All possible processes determining the state of nuclear matter at excitation energies approximately 10 MeV/nucleon are investigated in detail. Dynamic effects determining excitation parameters of the nuclear system appearing during collision of heavy ions are considered. A simple analytical model for the calculation of mass distributions of flying-out fragments and their multiplicity is suggested. The model demonstrates that multifragmentation ("complete explosion") of colliding nuclei takes place in cases of not very low initial energies and more central collisions. The important role of effects of incomplete statistic equilibrium is noted.

40849 (JINR—D-7-83-644, pp 128-157) **Beta decay far from stability and its role in nuclear physics and astrophysics.** Klapdor, H.V. (Max-Planck-Institut fuer Kernphysik, Heidelberg (Germany, F.R.)). 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

A microscopic description of the beta decay of nuclei far from stability is presented. Predictions of fission barrier heights, optical potentials, beta decay half-lives, β-delayed neutron and fission rates have been obtained for approximately 6000 neutron-rich nuclei between beta stability line and neutron drop line. Consequences of obtained data are applied to astrophysics (the astrophysical r process, cosmochronology, galactic neutrons) and nuclear physics (fission barriers from β-delayed fission, double beta decay, nucleon density distributions and charge exchange reactions, electron and antineutrino spectra from nuclear reactors).

40850 (JINR—D-7-83-644, pp 319-323) **Effective cluster numbers and heavy fragmentation processes of atomic nucleus.** Kadmenskij, S.G.; Smirnov, Yu.F.; Chuvil'skij, Yu.M. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki). 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The problem of describing clusterization processes of atomic nuclei is considered. The concept of effective number Wsub(x) of composite particles x in nucleus A is used as a physical value characterizing cluster degrees of nucleus freedom. Value Wsub(x) is determined as the sum of spectroscopic factors Wsub(xc) in all opened and closed c channels of decay of nucleus A with the production of particle x and daughter nucleus (A-Asub(x)). Wsub(x) values for a number of nuclei are presented. It is shown that Wsub(x) values rise with A growth according to the Wsub(x) approximately Asup(4/3) law and for A>=40 surpass A values. Forbidden factors for heavy fragmentation of atomic nuclei are discussed.

40851 (JINR—D-7-83-644, pp 371-380) **Fast fission phenomena.** Ngo, C. 1983. NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The mechanism of the fussion process is investigated. Particular attention is paid to the fast fission mechanism and under which conditions it can be observed. The consideration is based on the results of a dynamical model. Fast fission can occur in two cases: the fission barrier of the compound nucleus vanishes due to angular momentum and the saddle configuration of the compound nucleus is too compact (quasiffision). The problem is discussed for the $^{40}Ar+^{165}Ho$ reaction. In the framework of the model the fusion occurs if the effective fissility parameter introduced by Swiatecki is smaller than about 47.

40852 (JINR—D-7-83-644, pp 389-404) **Analysis of a fissility of nuclei by light and heavy ions.** Ignatyuk, A.V.; Smirenkin, G.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

The problem of fissionability of nuclei by light and heavy ions is discussed. Microscopic methods of calculating statistic characteristics of nuclei are considered. Phenomenologic analysis of the influence of shell and collective effects on the density of levels and fissionability of nuclei is performed. The data on fission barriers of preactinide nuclei are presented. The conclusion is made that a sufficiently well agreed sum of data on fission barriers of preactinide nuclei with the mass number Asub(f)>170 exists nowadays, it was obtained in reactions with protons, α particles and ^{6}Li ions. It is noted that the account of collective effects in the description of density of levels of excited nuclei permits to eliminate many discrepancies in results of analysis of fissionability of nuclei.

40853 (JINR—D-7-83-644, pp 420-430) **Investigation of the pre-actinide nucleus fission.** Muzychka, Yu.A.; Pustyl'nik, B.I. 1983. (In Russian). NTIS (US Sales Only), PC A25/MF A01. File Number DE85781272. (CONF-830444—).

From International school-seminar on heavy ion physics; Alushta, USSR (14 Apr 1983).

Fission of preactinide nuclei is investigated. In the framework of the statistical model the experimental data on fission cross sections of compound nuclei from ^{170}Yb to ^{210}Po by ^{12}C ions and angular distributions of fission fragments are analyzed. Dependences of fission barriers and inverse effective moment of inertia Isub(sph)/Isub(eff). (Isub(sph) is solid body moment of sphere inertia equalling the given nucleus) on Z^2/A parameter, are presented. Angular distributions of fission fragments in the $^{197}Au(^{22}Ne, f)$ and $^{197}Au(^{22}Ne, \alpha f)$ reactions are measured. The angular distribution of fission fragments of the compound ^{219}Ac nucleus calculated with account of contributions of emissive fission agree well with experiment at the critical value of the angular momentum lsub(cr)=90 and ratio Isub(sph)/Isub(eff)--1.2. The angular anisotropy is 6.2.

40854 (LA-UR—85-2075) **High nuclear temperatures by antimatter-matter annihilation.** Gibbs, W.R.; Strottman, D. (Arizona State Univ., Tempe (USA); Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 12p. (CONF-850315—8). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014113.

From Conference on antinucleon and nucleon-nucleus interactions; Telluride, CO, USA (18 Mar 1985).

It is suggested that the quark-gluon phase be created through the use of antiproton or antideuteron beams. The first advantage to this method, using higher energy antiprotons than 1.5 GeV/c, is that the higher momenta antiprotons penetrate more deeply so that mesons produced are more nearly contained within the nucleus. Another advantage is that the annihilation products are very forward-peaked and tend to form a beam of mesons so that the energy density does not disperse very rapidly. Calculations were performed using the intranuclear cascade to try to follow the process of annihilation in some detail. The intranuclear cascade type calculation method is compared to the hydrodynamic approach. 8 refs., 8 figs. (LEW)

40855 (LA-UR—85-2119) **Nuclear interlevel transfer driven by electronic transitions.** Solem, J.C.; Rinker, G. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 20p. (CONF-8505174—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014103.

From IDA workshop on gamma-ray lasers; Alexandria, VA, USA (21 May 1985).

We show how a gamma-ray laser might be made by optically exciting a transfer of population from a long-lived isomer to an energetically adjacent short-lived state of the same nucleus. We compare the advantages of using transitions of high multipolarity versus transitions of low multi-polarity. Preliminary numerical investigations of the mechanism show it to be somewhat favorable. 35 refs., 4 figs.

40856 (OUP—83-05) Manifest rotation symmetric expressions for angular momentum eigenfunctions. Eeg, J.O.; Wroldsen, J. (Oslo Univ. (Norway). Fysisk Inst.). Jan 1983. 34p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781057.

Manifest rotation symmetric expressions for eigenfunctions for spin s, orbital angular momentum l and total angular momentum j = l+s, ... , /l-s/ in terms of (2j+1) x (2s+1) multipole transition matrices (MTM) is given. These matrices, which are irreducible tensor matrices, have an algebra together with ordinary spin matrices for spin s and spin j. Explicit expressions for MTM's and their algebra are given for angular momenta <-3. By means of some examples it is shown that within this formalism angular integrations in central field problems will be simplified considerably. Thus the formalism turns out to be very useful for instance for calculations within the MIT-bag and also within spin-spin interactions in atomic physics.

40857 (OUP—84-17) Manifest rotation symmetric expressions for angular momentum eigenfunctions II. Eeg, J.O.; Wroldsen, J. (Oslo Univ. (Norway). Fysisk Inst.). Apr 1984. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781058.

Expressions for eigenfunctions for spin s, orbital angular momentum l, and total angular momentum j in terms of (2s+1) x (2j+1) multipole transitions matrices (MTM) is considered. In a previous report explicit expressions were given for angular momenta s, j <= 3. The present report completes the previous work by giving expressions for arbitrary values of s, l and j.

40858 Quarks, bags and the nucleon-nucleon interaction. Brown, G.E. (State Univ. of New York, Stony Brook). *AIP (American Institute of Physics) Conference Proceedings;* No. 57, 389-397(1983). (CONF-821050—). Contract AC02-76ER13001.

From Cyclotron facility workshop; Bloomington, IN, USA (27 Oct 1982).

It is argued that pionic couplings have a greater influence on the short-range nucleon-nucleon interaction than the quark degrees of freedom. 20 references, 1 figure.

40859 First order interpretation of optical potentials. Ray, L. (Univ. of Texas, Austin). *AIP (American Institute of Physics) Conference Proceedings;* No. 57, 121-142(1983). (CONF-821050—).

From Cyclotron facility workshop; Bloomington, IN, USA (27 Oct 1982).

The ability of local, second order, spin-dependent Kerman, McManus and Thaler optical potential models to describe proton nucleus elastic scattering data from 300-800 MeV is reviewed. Calculations which rely on the impulse approximation are fairly successful at 800 MeV but fail significantly for energies less than 500 MeV. Evidence is presented which indicates that medium effects are quite important in modifying the true proton-nucleon effective interaction from that given by the impulse approximation throughout the intermediate energy range, even at 800 MeV. It is concluded that the trends of the intermediate energy optical potentials can be accounted for qualitatively in terms of non-relativistic multiple scattering theory and medium modified effective interactions. The Glauber model and Dirac phenomenological approaches are briefly discussed. 49 references, 23 figures.

40860 Momentum-space optical potential SND elastic scattering calculations. Wolfe, D.H.; Hynes, M.V.; Picklesimer, A.; Tandy, P.C.; Thaler, R.M. (Kent State Univ., OH). *AIP (American Institute of Physics) Conference Proceedings;* No. 57, 149(1983). (CONF-821050—).

From Cyclotron facility workshop; Bloomington, IN, USA (27 Oct 1982).

Initial results are presented for proton-nucleus elastic scattering observables calculated with a newly developed microscopic momentum-space code. This is the first phase of a program to treat elastic and inelastic scattering consistently via an integral equation approach. A number of microscopic features which are often approximated or ignored are quite amenable to exact treatment within this approach, e.g. non-local effects in elastic scattering, and inelastic effects which are non-linear in the NN t-matrix and target densities but nevertheless confined to one participating nucleon. 3 references.

40861 Three-body forces. Friar, J.L. (Los Alamos National Lab., NM). *AIP (American Institute of Physics) Conference Proceedings;* No. 57, 378-388(1983). (CONF-821050—).

From Cyclotron facility workshop; Bloomington, IN, USA (27 Oct 1982).

Three-body forces are defined and their properties discussed. Evidence for such forces in the trinucleon bound states and scattering reactions is reviewed. The binding energy defects of the trinucleon bound states, the ^{3}He charge density, the Phillips line for doublet n-d scattering lengths, and three-nucleon breakup reactions are discussed, together with the possible influence of three-body forces on these observables. 23 references, 6 figures, 1 table.

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 39173, 39174, 39177, 39179, 39181, 39182, 39183, 39184, 39797, 39859, 39965, 39968, 40412

40862 (AD-A—153676/2/XAB) Comparison of calculations and measurements of the off-axis radiation dose (SI) in liquid nitrogen as a function of radiation length. Master's thesis. Cromar, P.F. (Naval Postgraduate School, Monterey, CA (USA)). Dec 1984. 73p. NTIS, PC A04/MF A01.

Results are presented from a study of the off-axis x and gamma radiation field caused by a highly relativistic electron beam in liquid nitrogen at various path lengths out to 2 radiation lengths. The off-axis dose in silicon was calculated using electron/photon transport code CYLTRAN and measured using thermal luminescent dosimeters (TLD's). Calculations were performed on a CDC-7600 computer ar Los Alamos National Laboratory and measurements were made using the Naval Postgraduate School 100-MeV Linac. Comparison of the results is made and CYLTRAN is found to be in agreement with experimentally measured values. The CYLTRAN results are extended to the off-axis dose caused by a 100-MeV electron beam in air at Standard Temperature and Pressure (STP).

40863 (AERE-R—11418) Projectile charge dependence of heavy ion stopping. Read, P.M. (UKAEA Atomic Energy Research Establishment, Harwell. Nuclear Physics Div.). Oct 1984. 96p. HMSO, London, price Pound 7.00.

The dependence of the electronic stopping power upon projectile charge has been investigated by measuring the energy loss of 3 MeV/u He, Li, C and O ions in carbon foils. The stopping powers for He and Li ions are found to scale approximately as the square of the projectile charge Z_1^2, which is consistent with current theories which predict a near cancellation of the Z_1^3 and Z_1^4 corrections to Bethe stopping theory. For the heavier ions all charge states show departures from Z_1^2 scaling, considerably in excess of the predictions of current theory. The energy-loss data for the various charge states of individual ions converge as the foil thickness increases. To interpret the heavy-ion energy-loss data, account has been taken of the processes of charge exchange that the projectile undergoes as it passes through the target. This required the measurement of the cross sections for charge exchange of 3 MeV/u O ions in carbon. The energy loss results indicate that a significant part of the heavy ion total stopping arises from charge-changing events. The magnitude of this component is comparable to the polarization and Bloch correction terms. A procedure for the incorporation of charge changing energy loss in stopping theory is discussed.

40864 (BARC—1222) BARC-35: A 35 group cross-section library with P_3-anisotropic scattering matrices and resonance self-shielding factors. Garg, S.B.; Sinha, A. (Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.). 1984. 5p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781059.

A 35 group cross-section set with P_3-anisotropic scattering matrices and resonance self-shielding factors has been generated from the basic ENDF/B-IV cross-section Library for 57 reactor

elements. This library, called BARC35, is considered to be well suited for the neutronics and safety analysis of fission, fusion and hybrid systems.

40865 **(EFI—621(11)-83) Comparative spectra and total cross sections of pair production by photons in various crystals.** Avakyan, R.O.; Akopov, N.Z.; Darbinyan, S.M.; Oganesyan, K.M. (Erevanskij Fizicheskij Inst. (USSR)). 1983. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701749.

The production of electron-positron pairs by high energy photons in crystals is considered. The analytical expression for the total cross section of coherent pair production by photons in crystals is obtained. The energy and orientation dependence of the differential and total cross sections of the pair production in diamond, silicon and corundum crystals by 1 GeV, 5 GeV and 10 GeV photons is investigated. 8 references, 9 figures.

40866 **(EFI—669(59)-83) Above-barrier reflection by the planar channelling of electrons and positrons in crystals.** Ajrapetyan, G.A.; Babakhanyan, Eh.A. (Erevanskij Fizicheskij Inst. (USSR)). 1983. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701750.

The behaviour of coefficients of Bloch waves reflection from potential barrier and well for the nearest above-barrier energetic band as a function of quasimomentum in the Brillouin zone is investigated for different energies of channeled electrons and positrons. The variation of the above-barrier reflection coefficients for the whole energy spectrum by transition from one energy band to another for each fixed energy value of insident particles is studied too. The oscillating behaviour of relection coefficients is shown. 6 references, 6 figures.

40867 **(IC—84/110) Core electron energy loss spectra in metallic La.** Nuroh, K. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1984. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701571.

The calculation of relative intensities for electron excited $4d^{10} \rightarrow 4d^{9}nf$, epsilon f transitions in metallic La has been discussed on the basis of the inelastic electron mechanism invoked by Netzer et al. [Phys. Rev. Lett. 51, 211(1983)]. The analysis indicates that for incident electron energies far away from the core level excitation threshold, direct Coulomb interaction processes are the most prominent; as the incident electron energy approaches threshold, exchange processes feature as prominently, giving support to the stage-wise breakdown of selection rules in electron impact excitation suggested by Netzer et al.

40868 (INIS-BR—260, pp 438-453) **Study and application of Morse computer code in radiation shielding problems.** Vieira, W.J.; Mendonca, A.G.; Maiorino, J.R. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

The uses of Morse computer code by the group of radiation transport and Shielding of IPEN (Instituto de Pesquisas Energeticas e Nucleares) are shown. Three sample problems published in the literature were solved, aiming to compare the results obtained. A small introduction on the logical construction and potentialities of the code is presented.

40869 (INIS-mf—9482, pp 63) **Passage of 14 MeV neutrons through lead.** Kralik, M.; Tichy, M.; Spurny, F. (Ceskoslovenska Akademie Ved, Prague. Ustav Dozimetrie Zareni). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

40870 (INIS-SU—282, pp 550) **Calculation of a mean free path of inelastic scattering and mean energy losses of 50 keV electrons in solids.** Khlupin, S.I. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40871 (INIS-SU—282, pp 402) **Program for processing spectra of characteristic x-radiation induced by accelerated charged particles.** Klyuchnikov, A.A.; Ryloshko, V.A.; Shcherbin, V.N. 1984. (In Russian). NTIS (US Sales Only), PC A99/MF A01. File Number DE85780893. (CONF-8404189—Summ.).

From 34. conference on nuclear spectroscopy and nuclear structure; Alma-Ata, USSR (17 Apr 1984).

40872 (JAERI-M—83-223) **Stopping power for ions in solids.** Kitagawa, Mitsuo. (Japan Atomic Energy Research Inst., Tokyo). Dec 1983. 30p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701807.

During these two decades, the researches of the stopping power for ions in solids have made several progresses in the fields of atomic collisions in solids, radiation physics, nuclear fusion and related regions of ion-solid interactions. In the case of the stopping power for light ions at high energy region, the detailed analyses of the mean ionization energy were performed for many kinds of solids. The experimental analyses of the Z_1^3 and Bloch corrections were also made to measure the higher order contributions quantitatively. The experimental formula and data tables of stopping power for H and He ions covered over the region from low to high energies were derived by use of the parameterization methods. As far as the heavy ions concern, the theoretical analyses of the effective charge for stopping power were performed, and it turned to be able to analyze the experimental data within the resolution of +-10--20%.

40873 (JAERI-M—84-018) **Exposure, dose-equivalent and absorbed-dose buildup factors of gamma rays for plane normal and isotropic incidences on water, concrete, iron and lead.** Tanaka, Shun-ichi; Takeuchi, Kiyoshi. (Japan Atomic Energy Research Inst., Tokyo). Feb 1984. 35p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701808.

Exposure, dose-equivalent and absorbed-dose buildup factors are calculated using a discrete-ordinates direct integration code, PALLAS-PL, SP-Br, for water, concrete, iron and lead, typifying materials of low, medium, high atomic number for gammaray sources at plane normal and isotropic incidences. These data include the effects of secondary photon sources arising from Compton scattering, Bremsstrahlung and annihilation. Inclusion of Bremsstrahlung source has great influence on these buildup factors for high energy photons in materials of high atomic number. The calculated buildup factors are tabulated for incident energies of 0.1 to 15 MeV (0.4 to 15 MeV only for lead) and penetration depths up to 40 mean-free-paths in each material.

40874 (JINR—1-84-372) **Coherent bremsstrahlung from 10 GeV positrons in thin Si crystal.** Bulgakov, N.K.; Vodop'yanov, A.S.; Vojtkovska, I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1984. 3p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701755.

Experimental and calculated spectra of radiation are presented for 10 GeV positrons with small incident angles with respect to the (110) plane in silicon single crystal 103 μm in thickness. It is shown that the spectral density of radiation, calculated using coherent bremsstrahlung theory taking into account incident beam angular divergence, agrees with experimental data for incident angles behind the critical channeling angle. 11 references, 2 figures.

40875 **(JINR—E-2-84-506) Flat problem of the linear transport theory for uniform semispace and Mnatsakanjan semigroup method.** Chernenko, L.P.; Zastavenko, L.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems; Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701809.

A stationary kinetic equation of the linear transport theory in a uniform semispace is considered. The aim of the work is to reduce the problem to the solution of equation with a diminished number of variables. With this aim a semigroup of operators associated with the initial kinetic equation is introduced into consideration. The result is reducing of the problem to the albedo kernel R(p, q) in the region of $p_3<0$, $q_3> = 0$ determination (q is the momentum of particle which enters the semispace; p- the momentum of particle which leaves the semispace; q_3 and p_3 are the momentum projections on the normal to the semispace surface). This result seems to be obtained using the Ambartsumian method of invariant immersion as well. 2 references.

40876 **(JINR—R-3-83-892) Search for the phonon analog of Cherenkov radiation at the neutron passage flight through matter.** Ignatovich, V.K.; Mittag, Z.; Pul'ts, V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1983. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701804.

The transmission of a beryllium sample was investigated with the aim to find out the phonon analog of Cherenkov radiation at the neutron flight through matter. Slowing down of the neutrons and additional scattering cross section were used for search for effects. The absence of effects leads to some limitations on phonon dispersion curve parameters. 6 references, 6 figures.

40877 **(JINR—R-14-84-414) Thermal neutron scattering in MBBA and EBBA solid phases.** Belushkin, A.V.; Zaleski, T.; Natkanets, I.; Dolganov, V.K.; Sheka, E.F.; Navrotsik, V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1984. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701803.

The diffraction and inelastic incoherent neutron scattering (IINS) measurements were performed on the liquid crystal samples of MBBA and EBBA. The nematic, glasslike and stable crystal phases were investigated. The diffraction and IINS spectra were measured simultaneously on the KDSOG spectrometer at the IBR-30 reactor. The diffraction spectra were used to control the phase situation at the sample. From the experimental IINS results the weighted phonon densities of states are obtained and specific heat is calculated. The difference of these characteristics for glasslike and stable crystal phases is discussed. 14 references, 9 figures.

40878 **(LA-UR—85-1756) Configuration for the WNR data acquisition system for neutron measurements.** Nelson, R.O.; Barrus, D.M.; Cort, G.; Goldstone, J.A.; McMillan, D.E.; Miller, L.B.; Poore, R.V.; Machen, D.R. (Los Alamos National Lab., NM (USA); Scientific Systems International, Los Alamos, NM (USA)). 1985. Contract W-7405-ENG-36. 5p. (CONF-850579—6). NTIS, PC A02/MF A01; GPO Dep. File Number DE85012748.

From 4. topical conference on computerized data acquisition in particle and nuclear physics; Chicago, IL, USA (19 May 1985).

The configuration for a new data acquisition system for the Weapons Neutron Research Facility at the Los Alamos National Laboratory is introduced. The system utilizes a FASTBUS front-end for real-time data collection and DEC computers for the experiment control and analysis. A local area network is used extensively within the overall system. 6 refs., 3 figs.

40879 **(ORNL/TM—9179/R1) Updated users' guide for SAMMY: multilevel R-matrix fits to neutron data using Bayes' equations. Revision 1.** Larson, N.M. (Oak Ridge National Lab., TN (USA)). Apr 1985. Contract AC05-84OR21400. 70p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85015077.

In 1980 the multilevel multichannel R-matrix code SAMMY was released for use in analysis of neutron data at the Oak Ridge Electron Linear Accelerator. Since that time, SAMMY has undergone significant modifications: (1) User-friendly options have been incorporated to streamline common operations and to protect a run from common user errors. (2) The Reich-Moore formalism has been extended to include an optional logarithmic parameterization of the external R-matrix, for which any or all parameters may be varied. (3) The ability to vary sample thickness, effective temperature, matching radius, and/or resolution-broadening parameters has been incorporated. (4) To avoid loss of information (i.e., computer round-off errors) between runs, the "covariance file" now includes precise values for all variables. (5) Unused but correlated variables may be included in the analysis. Because of these and earlier changes, the 1980 SAMMY manual is now obsolete. This report is intended to be complete documentation for the current version of SAMMY. In August of 1984 the users' guide for version P of the multilevel multichannel R-matrix code SAMMY was published. Recently, major changes within SAMMY have led to the creation of version O, which is documented in this report. Among these changes are: (1) an alternative matrix-manipulation method for use in certain special cases; (2) division of theoretical cross-section generation and broadening operations into separate segments of the code; (3) an option to use the multilevel Breit-Wigner approximation to generate theoretical cross sections; (4) new input options; (5) renaming all temporary files as SAM??.DAT; (6) more sophisticated use of temporary files to maximize the number of data points that may be analyzed in a single run; and (7) significant internal restructing of the code in preparation for changes described here and for planned future changes.

40880 **(RAL—84-100) Occurence of an effective anharmonic velocity dependent potential.** Gunn, J.M.F. (Rutherford Appleton Lab., Chilton (UK)). Nov 1984. 21p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781053.

An integrable dynamical problem of a classical neutral particle interacting with an inhomogeneous magnetic field via a magnetic dipole moment is considered, which had previously been studied quantum mechanically. The equation for the centre of mass velocity is of second order resembling that of an anharmonic oscillator with velocity replacing position in the equation. The velocity undergoes curious oscillations, where the spin and centre of mass degrees of freedom exchange energy, although there is also, in general, a uniform component to the velocity. An application to the motion of a classical "neutron" in a magnetic domain wall is discussed, and comparison with previous quantum treatments made.

40881 **(RAL—84-118) Neutron tests on samarium polarising filters.** Mayers, J.; Cywinski, R.; Jones, T.J.L.; Williams, W.G. (Rutherford Appleton Lab., Chilton (UK)). Dec 1984. 35p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781054.

Results are presented of tests on resonance absorption neutron polarising filters containing Sm^{149}. The temperature dependence of the transmittance was measured as a function of neutron energy using the time of flight method on a pulsed source. These measurements allowed the polarising efficiencies of a $SmCo_5$ filter to be determined at temperatures between 0.012K and 0.045K. Preliminary data was also obtained for a filter consisting of a 1% solution of samarium in palladium and gave encouraging results. The authors describe some of the practical problems encountered during the measurements and discuss implications for future operations on the RAL Spallation Neutron Source.

40882 **(RAL—84-126) f-sum rule for magnetic neutron-electron scattering.** Lovesey, S.W.; Trohidou, K.N. (Rutherford Appleton Lab., Chilton (UK)). Dec 1984. 19p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701805.

The authors show that measurements of the first frequency moment of the response function observed in magnetic neutron scattering from electrons will feature details of the electron correlations. The first frequency moment, or f-sum rule as it is often called, for magnetic scattering is therefore distinctly different from the corresponding sum rule for particle density interactions. The behaviour of the magnetic f-sum rule as a function of wave vector

is illustrated, together with the mean-square energy transfer, in an approximate calculation for an electron plasma.

40883 **Measurement of transition radiation from medium-energy electrons.** Piestrup, M.A.; Kephart, J.O.; Park, H.; Klein, R.K.; Pantell, R.H.; Ebert, P.J.; Moran, M.J.; Dahling, B.A.; Berman, B.L. (Department of Electrical Engineering, Stanford University, Stanford, California 94305). *Physical Review [Section] A: General Physics;* **32**: No. 2, 917-927(Aug 1985). Contract W-7405-ENG-48.

The absolute differential production efficiencies (photons/eV sr electron) for x rays emitted from each of three transition radiators were measured for incident electron-beam energies of 17.2, 25, and 54 MeV. The radiators were made of stacks of 1.0-μm-thick foils: 18 foils of beryllium, 18 foils of carbon, and 30 foils of aluminum. The radiation spectra were most intense between 0.5 and 2.5 keV, peaking at 0.8, 1.3, and 1.3 keV, respectively. The angular distribution of the transition radiation from the beryllium-foil stack was measured for the three electron-beam energies and found to agree well with theoretical predictions. Owing to K-shell absorption, the photon-energy spectra from the carbon and aluminum stacks are narrowed. Theoretical calculations, which include both the two-surface interference and photon attenuation in the foil material, agree well with these data. A method of enhancing output using a split-foil stack is considered; cursory experiments with a split stack of Mylar foils showed enhanced emission. The use of transition radiation as a source of x rays for lithographic purposes may be practical.

40884 **Predictive models based on sensitivity theory and their application to practical shielding problems.** Bhuiyan, S.I.; Roussin, R.W.; Lucius, J.L.; Bartine, D.E. (Oak Ridge National Lab., TN (USA)). pp 54-63 of Proceedings of the sixth international conference on radiation shielding, 1. Tokai, Japan; Japan Atomic Energy Research Inst. (1983). (CONF-830538—Pt.1).

From 6. international conference on radiation shielding; Tokyo, Japan (16 May 1983).

Two new calculational models based on the use of cross-section sensitivity coefficients have been devised for calculating radiation transport in relatively simple shields. The two models, one an exponential model and the other a power model, have been applied, together with the traditional linear model, to 1- and 2-m-thick concrete slab problems in which the water content, reinforcing steel content, or composition of the concrete was varied. Comparing the results obtained with the three models with those obtained from exact one-dimensional discrete ordinates transport calculations indicates that the exponential model, named the BEST model (for basic exponential shielding trend), is a particularly promising predictive tool for shielding problems dominated by exponential attenuation. When applied to a deep-penetration sodium problem, the BEST model also yields better results than do calculations based on second-order sensitivity theory.

40885 **Neutron-induced photon production in MCNP.** Little, R.C.; Seamon, R.E. (Los Alamos National Lab., NM (USA)). pp 151-160 of Proceedings of the sixth international conference on radiation shielding, 1. Tokai, Japan; Japan Atomic Energy Research Inst. (1983). (CONF-830538—Pt.1).

From 6. international conference on radiation shielding; Tokyo, Japan (16 May 1983).

An improved method of neutron-induced photon production has been incorporated into the Monte Carlo transport code MCNP. The new method makes use of all partial photon-production reaction data provided by ENDF/B evaluators including photon-production cross sections as well as energy and angular distributions of secondary photons. This faithful utilization of sophisticated ENDF/B evaluations allows more precise MCNP calculations for several classes of coupled neutron-photon problems.

40886 **Standard reference data for gamma-ray transport in homogeneous media.** Trubey, D.K. (Oak Ridge National Lab., TN (USA)). pp 1241-1247 of Proceedings of the sixth international conference on radiation shielding, 2. Tokai, Japan; Japan Atomic Energy Research Inst. (1983). (CONF-830538—Pt.2).

From 6. international conference on radiation shielding; Tokyo, Japan (16 May 1983).

An American Nuclear Society Standards Committee Working Group, identified as ANS-6.4.3, is developing a set of evaluated gamma-ray isotropic point-source buildup factors and attenuation coefficients for a standard reference data base. As a first step, a largely unpublished set of buildup factors calculated with the moments method is being evaluated by recalculating key values with Monte Carlo, integral transport, and discrete ordinates methods. Attention is being given to frequently neglected processes such as bremsstrahlung and the effect of introducing a tissue phantom behind the shield. The proposed standard will contain data for a source energy range from 15 keV to 15 MeV and for approximately 12 elements and 3 mixtures (water, air, and concrete).

40887 **Status of reactor shielding research in the United States.** Bartine, D.E. (Oak Ridge National Lab., TN (USA)). pp 526-535 of Proceedings of the sixth international conference on radiation shielding, 1. Tokai, Japan; Japan Atomic Energy Research Inst. (1983). (CONF-830538—Pt.1).

From 6. international conference on radiation shielding; Tokyo, Japan (16 May 1983).

Shielding research in the United States continues to place emphasis on (1) the development and refinement of shielding design calculational methods and nuclear data and (2) the performance of confirmation experiments, both to evaluate specific design concepts and to verify specific calculational techniques and input data. The successful prediction of the radiation levels observed within the now-operating Fast Flux Test Facility (FFTF) has demonstrated the validity of this two-pronged approach, which has since been applied to U.S. fast breeder reactor programs and is now being used to determine radiation levels and possible further shielding needs at operating light water reactors, especially under accident conditions. A similar approach is being applied to the back end of the fission fuel cycle to verify that radiation doses at fuel element storage and transportation facilities and within fuel reprocessing plants are kept at acceptable levels without undue economic penalties. Finally, the same approach is being used to develop a sophisticated fusion reactor shielding technology and to study shields for possible future space power reactor systems.

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REFER ALSO TO CITATIO. '(S) 39342, 39365, 39879, 39886, 39900, 39958, 40143, 40144, 40145, 40284

40888 **(CEA-IPSN-DPS—84-04) Correspondence between activity and mass for the annual limits on intake by inhalation for occupational exposure.** Piechowski, J.; Le Tohic, J. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Protection). 1984. 101p. (In French). NTIS (US Sales Only), PC A06/MF A01. File Number DE85751931.

Annual limits on intake (ALI) by inhalation for occupational exposure are given in ICRP publication 30. They are expressed in activity (Bq), and this report gives the corresponding value in mass (g). For each isotope, the correspondence between activity and mass has been determined for gases, (noble gases, hydrogen) there are no ALIs but only limits of concentration in air (DAC). For these particular cases, the correspondence mass-activity has therefore been determined for the DACs, again taking into account the more restrictive DACs only.

40889 **(EHD—83-89) National dose registry of Canada.** (Department of National Health and Welfare, Ottawa, Ontario (Canada). Health Protection Branch). Apr 1982. 35p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701639.

French version included.

In 1951, when the National Dosimetry Service was established by the Department of National Health and Welfare, a system of centralized records was created as an integral part of the new service. Over the last few years the dose record system has expanded in size and content, and improvements have been made in the

physical methods of record storage. In addition to the 250 000 individual dose records from the National Dosimetry Service, the National Dose Registry now includes internal tritium and external doses from nuclear generating stations, and radon daughter exposures submitted by uranium mining companies. With the increase in the use of radiation in the medical, industrial and research fields, it is becoming more important to have a comprehensive and readily accessible centralized record system. The Canadian National Dose Registry is particularly suited for continuing health risk studies of radiation workers and provides a base for future epidemiological studies.

40890 **(EHD—83-90) Environmental radioactivity in Canada, 1980. Radiological monitoring annual report.** McGregor, R.G.; Meyerhof, D.P.; Quinn, J.M.; Tracy, B.L. (Department of National Health and Welfare, Ottawa, Ontario (Canada). Health Protection Branch). 1983. 60p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701640.

The radiological surveillance program of the Department of National Health and Welfare is conducted to determine levels of environmental radioactivity in Canada and assess the resulting population exposures. In this report, the results for 1980 from the analyses of air, precipitation, water vapour, drinking water, milk, biota and bone for critical radionuclides are presented. The graphical format is used with extensions of the trend-lines to enable identification of changes in the levels and assessment of their potential health significance. All the levels measured during this period are below the permissible limits recommended by the International Commission for Radiological Protection.

40891 **(EHD—83-91) Investigation of radiation emissions from video display terminals.** Zuk, W.M.; Stuchly, M.A.; Dvorak, P.; Deslauriers, Y. (Department of National Health and Welfare, Ottawa, Ontario (Canada). Health Protection Branch). 1983. 52p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701641.

This report presents and discusses the results of radiation emission measurements carried out on video display terminals (VDTs) by the Radiation Protection Bureau. While the report is not intended to be an exhaustive review of all of the world literature on the subject, the more important studies performed on VDTs are summarized and reviewed. Attention is drawn to recent information which has not yet become generally available.

40892 **(EHD—83-102) Environmental radioactivity in Canada, 1981. Radiological monitoring annual report.** McGregor, R.G.; Quinn, J.M.; Tracy, B.L. (Department of National Health and Welfare, Ottawa, Ontario (Canada). Health Protection Branch). 1983. 49p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701637.

The radiological surveillance program of the Department of National Health and Welfare is conducted for the purpose of determining levels of environmental radioactivity in Canada and assessing the resulting population exposures. Special investigations were carried out during 1981 on bottled mineral waters and in conjunction with unusual occurences at nuclear reactor sites and a uranium refinery. Dose commitments have been estimated for the ongoing natural radioactivity, fallout and reactor studies. All measurements made during the year are below the limits recommended by the International Commission on Radiological Protection.

40893 **(IAEA-TECDOC—321) Research in radiation processing dosimetry. Final report of the co-ordinated research programme on high-dose standardization and intercomparison for industrial radiation processing organized by the IAEA and proceedings of the final research co-ordination meeting held in Munich, 8-11 November 1983.** (International Atomic Energy Agency, Vienna (Austria)). Dec 1984. 240p. (CONF-8311247—). NTIS (US Sales Only), PC A11/MF A01. File Number DE85781407.

From Final research co-ordination meeting on high-dose standardization and intercomparison for industrial radiation processing; Munich, F.R. Germany (8 Nov 1983).

Individual items in scope for the data base are processed separately. (DLC)

40894 **(INIS-mf—9482, pp 119) Probability calculation of electron backscattering.** Seda, J.; Cechak, T.; Kluson, J. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia). Fakulta Jaderna a Fysikalne Inzenyrska). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

40895 **(INIS-mf—9532, pp 117-122) Recent recommendations on radiological protection standards in Israel.** Gonen, Y.G. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev); Stern, E. (Israel Atomic Energy Commission, Tel Aviv. Licensing Div.). 1983. NTIS (US Sales Only), PC A14/MF A01. File Number DE85780892. (CONF-831241—Summ.).

From Joint US/Israeli meeting on safety and siting problems for power reactors in a small country; Haifa, Israel (20 Dec 1983).

Published in summary form only.

40896 **(INIS-mf—9573-Vol.1, pp 168-178) Units and magnitudes used in radiological protection.** Iturbe Hermann, F. (Instituto Nacional de Investigaciones Nucleares, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781445.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Defined are terms used in radiological protection, such as: activity, exposure, rate of exposure, absorbed dose, rate of absorbed dose, kerma, equivalent dose, etc.

40897 **(INIS-mf—9573-Vol.2, pp 179-196) Basic standard for radiological protection.** Iturbe Hermann, F. (Instituto Nacional de Investigaciones Nucleares, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781409.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Delineated are standards for radiation protection intended to minimize the hazards of handling radioactive material.

40898 **(INIS-mf—9573-Vol.2, pp 310-319) Decontamination.** Parra Iniguez, A. (Comision Nacional de Seguridad Nuclear y Salvaguardias, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781409.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Decontamination and chemical and physical methods for decontaminating persons, clothes, areas and equipment are explained.

40899 **(INIS-mf—9573-Vol.2, pp 237-256) Regulations governing radiation dose limits to the individual.** Ortiz Magana, R. (Comision Nacional de Seguridad Nuclear y Salvaguardias, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A07/MF A01. File Number DE85781409.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Regulations governing radiation dose limits established in the governing regulations of 1966 and 1977 are given, including their rationale and optimization.

40900 **(INIS-mf—9624) List of foreign standards in nuclear technology.** Brabec, D. (ed.). (Ceskoslovenska Komise pro Atomovou Energii, Prague). Apr 1984. 200p. (In Czech). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781454.

The bibliography comprises international standards of CMEA, ISO, IEC and national standards of the USSR, GDR, FRG, France, UK, USA and Austria in the field of nuclear power,

nuclear engineering and the peaceful uses of ionizing radiation and radionuclides. Also included are standards covering other industrial sectors where the standardized object or activity is linked with ionizing radiation or radionuclides, as well as standards covering metrology, quality control and testing. The bibliography is complete with instructions for use, sources and a subject index and index of standard numbers.

40901 (INIS-mf—9644, pp 67-79) **ICRP recommendations and Canadian regulations.** Bush, W.R. (Atomic Energy Control Board, Ottawa, Ontario (Canada)). 1983. NTIS (US Sales Only), PC A08/MF A01. File Number DE85781436. (CONF-8211206—).

From Seminar on uranium and nuclear issues; Toronto, Ontario, Canada (2 Nov 1982).

The Canadian Atomic Energy Control Board is in the process of revising the radiation protection sections of its regulations in accordance with the latest recommendations of the International Commission on Radiological Protection. This paper discusses several issues involved in the proposed revisions.

40902 **(INIS-mf—9653) Working with radiation.** (British Nuclear Fuels Ltd., Risley). 1984. 41p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781452.

This simple booklet is written primarily to supply information about radiation, its potential dangers and radiation protection, to those working for, or considering taking up employment with, British Nuclear Fuels plc.

40903 **(INIS-mf—9656) Act of 14 July 1983 amending Act of 29 March 1958 relating to the protection of the population against the hazards of ionizing radiation.** (International Atomic Energy Agency, Vienna (Austria)). 6 Aug 1983. 8p. (In French and English). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781437.

Published in the Moniteur Belge; translation into English appended.

The Act of 29 March 1958 on protection of the population against the hazards of ionizing radiation has been amended by an Act of 14 July 1983. The amendments concern, in particular, the non-involvement of communal authorities in decisions taken under the Act, the inclusion of the concept of the environment as a complement to public safety, and the extension of the powers of officials responsible for supervising certain aspects of the transport of radioactive materials. Finally, a new Section has been added which empowers the King to suspend or cancel decisions by decentralised administrations which affect the transport of nuclear substances.

40904 **(INIS-mf—9662) Modification of 28 November 1983 of the Radiation Protection ordinance of 30 June 1976.** (International Atomic Energy Agency, Vienna (Austria)). 28 Nov 1983. 4p. (In French). NTIS (US Sales Only), PC A02/MF A01. File Number DE85781438.

This Ordinance modifies the 1976 Radiation Protection Ordinance. The amendment allocates responsibility for radiation control among various governmental bodies. The Federal Office of Public Health is responsible for all radiation protection controls whenever they involve the protection of the public at large and the Accident Insurance Office is responsible for the protection of workers. Radiation control in nuclear installations is the responsibility of the Principal Division for the Safety of Nuclear Installations.

40905 **(INIS-mf—9716) Radiation Safety (Qualifications) Regulations 1980.** (International Atomic Energy Agency, Vienna (Austria)). 6 Jun 1980. 3p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781498.

These Regulations, promulgated pursuant to the provisions of the Radiation Safety Act, 1975-1979, require persons engaged in activities involving radiation to pass a radiation safety examination or to possess an approved qualification in radiation. The National Health and Medical Research Council is authorised to exempt persons from compliance with these requirements or, conversely, to impose such requirements on persons other than those designated. (NEA).

40906 **(INIS-mf—9718) Health (Radiation Safety) Act 1983 (Victoria) No. 9889 of 17 May 1983.** (International Atomic Energy Agency, Vienna (Austria)). 17 May 1983. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781500.

This Act amends the Health Act 1958 by adding a new Section entitled Radiation Safety. In addition to establishing guidelines for the registration and licensing of certain radiation apparatus and sealed radioactive sources, this new Section authorises the Governor in Council to make regulations concerning, inter alia, transport and disposal of radioactive substances and public health and safety. The Act also sets up a Radiation Advisory Committee and a Radiographers and Radiation Technologists Registration Board of Victoria and amends the Nuclear Activities (Prohibitions) Act 1983 in respect of certain licensing provisions. (NEA).

40907 **(INIS-mf—9719) Health (Radiation Safety) Regulations 1984 (Victoria), No. 191 of 8 May 1984.** (International Atomic Energy Agency, Vienna (Austria)). 8 May 1984. 78p. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781501.

These Regulations promulgated pursuant to the Health Act 1958, as amended, repeal the Irradiating Apparatus and Radioactive Substances Regulations 1959. The provisions of the Regulations are designed to safeguard the public, patients and employees of registered premises from harmful effects of radiation. (NEA).

40908 **(INIS-mf—9721) Radiation Safety (General) Regulations 1983 (Western Australia).** (International Atomic Energy Agency, Vienna (Austria)). 21 Feb 1983. 82p. NTIS (US Sales Only), PC A05/MF A01. File Number DE85781503.

The provisions of the Regulations cover, inter alia, the general precautions and requirements relating to radiation safety of the public and radiation workers and registration of irradiating apparatus or premises on which such apparatus is operated. In addition, the Regulations set forth requirements for the operation of such apparatus and for the premises involved. (NEA).

40909 **(INIS-mf—9723) Radiation Safety (Qualifications) Amendment Regulations 1984.** (International Atomic Energy Agency, Vienna (Austria)). 19 Apr 1984. 1p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781504.

These Regulations amend the Radiation Safety (Qualifications) Regulations 1980 by establishing the fees to be paid for the radiation safety examination to be passed by persons engaged in activities involving radiation. (NEA).

40910 **(INIS-mf—9727) Health (Radiation Safety) (Amendment) Regulations 1984 (Victoria) No. 236 of 10 July 1984.** (International Atomic Energy Agency, Vienna (Austria)). 10 Jul 1984. 3p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781505.

These Regulations make minor technical amendments to the Health (Radiation Safety) Regulations of the State of Victoria. (NEA).

40911 **(INIS-mf—9733) Order of the Ministry of Labour of 9 March 1971 on health and safety at work. General Ordinance.** (International Atomic Energy Agency, Vienna (Austria)). 16 Mar 1971. 28p. (In Spanish). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781506.

Published in the Boletin Official del Estado.

This Order regulates the health protection of workers in all fields, including the field of radiation. It lays down provisions to be complied with for the safety of workers involved with infrared and ultra-violet rays as well as with ionizing radiation. (NEA).

40912 (KIYI—83-11, pp 8-12) **Investigation of radiation dose fields from the fast neutron beams obtained from d(50 MeV) → Be reaction.** Popov, V.I.; Portman, A.I.; Burdin, A.A. (Institut Mediko-Biologicheskikh Problem, Moscow (USSR)); Chebotarev, E.E.; Bukanov, V.N.; Kataevskij, Yu.F.; Tkachenko, N.A. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781275.

In Radiobiological studies on the U-240 isochronous cyclotron during 1982.

The uniformity of dose field of fast neutrons in the air at a distance of 125 cm from the target and depth dose distributions in tissue equivalent liquid and solid phantoms has been measured by ionization chambers of condenser type and IKS-A dosemeters. Qualitative evaluation of the IKS-A dosemeter sensitivity to the spectrum of neutrons with the mean energy of approximately 20 MeV is made.

40913 (KIYI—83-11, pp 12-15) **Inspection of Bragg-Gray theory applicability to the ionization chamber, irradiated by approximately 20 MeV neutrons.** Bukanov, V.N.; Kataevskij, Yu.F.; Tkachenko, N.A. 1983. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781275.

In Radiobiological studies on the U-240 isochronous cyclotron during 1982.

Applicability of the Bragg-Gray ratio to an ionization chamber manufactured of tissue-equivalent electroconductive composite material with a 1 cm^3 cavity has been studied. At a dose rate of neutron radiation 1.6 Gy/min, the chamber structure is shown to meet the requirements of the Bragg-Gray theory.

40914 (SAAS—321) **Occupational radiation exposure in the GDR in 1981.** Poulheim, K.F.; Rothe, W.; Scheler, R. (Staatliches Amt fuer Atomsicherheit und Strahlenschutz, Berlin (German Democratic Republic)). 1984. 26p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701643.

As in the previous year, the centralized monitoring of radiation workers for occupational exposure was carried out on the basis of film badges (38,415 persons), measurements with a whole-body counter and analyses of biosamples (252 persons in all). According to the film data, the monthly exposures exceeding 4 mGy totalled 645 including 41 doses higher than 10 mGy. Five workers received annual doses above 50 mGy, with the highest values being 840 mGy. For the exposed population as a whole and some subgroups, annual collective and mean annual doses have been given. In assessing internal exposure situation, use has been made of both data from the centralized monitoring program and those determined by some nuclear facilities themselves under the auspices of the SAAS. The results gave no indication of internal doses exceeding the annual limits of intake.

40915 (UCRL—88332) **Fabrication of a set of realistic torso phantoms for calibration of transuranic nuclide lung counting facilities.** Griffith, R.V.; Anderson, A.L.; Sundbeck, C.W.; Alderson, S.W. (Lawrence Livermore National Lab., CA (USA); Humanoid Systems, Carson, CA (USA)). 26 Oct 1983. Contract W-7405-ENG-48. 5p. (CONF-840512—22). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013972.

From 6. congress of the International Radiation Protection Association; Berlin, F.R. Germany (7 May 1984).

A set of 16 tissue equivalent torso phantoms has been fabricated for use by major laboratories involved in counting transuranic nuclides in the lung. These phantoms, which have bone equivalent plastic rib cages, duplicate the performance of the DOE Realistic Phantom set. The new phantoms (and their successors) provide the user laboratories with a highly realistic calibration tool. Moreover, use of these phantoms will allow participating laboratories to intercompare calibration information, both on formal and informal bases. 3 refs., 2 figs.

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6560 Solid-state Physics

REFER ALSO TO CITATION(S) 39474, 39573, 39625, 40073, 40661

40916 (CBPF-NF—035/83) **Comment on 'Convexity of the free energy in some real-space renormalization-group approximations'.** Tsallis, C. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1983. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701710.

A recent paper by Kaufman and Griffiths is commented which induces to think that certain types of real-space renormalization group are not able to preserve standard thermodynamic convexity properties. It is pointed out that this is not the case for at least one of those types, if form-invariance (under uniform translation of the energy scale) of a central equation is demanded.

40917 (DOE/ER/10864—1) **International project in history of solid state physics. Final report.** Weart, S.R. (American Inst. of Physics, New York). Sep 1984. Contract FG02-81ER10864. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014843.

The International Project in History of Solid State Physics got underway in 1981, planning a large collaborative program to preserve and make known the history of this field. The Project's scholars and sponsors were spurred by the realization that although solid state physics is one of the most important influences on late twentieth civilization, its history was all but unknown to historians, to the public at large, and even to most physicists. The chief aim of the Project was to create a new and enduring area of historical activity, and this aim has been accomplished. As we hoped, most of the scholars who have been drawn to this field plan to continue to study and publish in the history of solid state physics, building upon the research and resources assembled under the Project.

40918 (IFT-P—11/84) **Crystalline and amorphous solid phases in the classical hard sphere system.** Aguilera-Navarro, V.C.; Souza, R.F.T.; Llano, M. de; Mini, S. (Instituto de Fisica Teorica, Sao Paulo (Brazil)). 1984. 25p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701709.

A qualitative crystalline, as well as amorphous, solid behavior is simultaneously extracted for a classical hard sphere system from its known virial power series expansion in the density augmented by only one further virial coefficient, taken from an extrapolated estimate of the Cauchy-Hadamard radius of convergence criterion. Results are compared with computer simulation data.

40919 (IS-T—1136) **Nonlinear polariton effects in naphthalene.** Stevenson, S.H. (Ames Lab., IA (USA)). Jul 1985. Contract W-7405-ENG-82. 223p. NTIS, PC A10/MF A01; GPO Dep. File Number DE85015589.

Thesis.

Resonant second harmonic generation (SHG) and two-photon excited emission (TPE) were studied in pure, strain-free crystals of naphthalene at frequencies near that of the (0,0) a-exciton in order to probe the relationship between the two signals and to investigate the effect of polariton states on second order nonlinearities in molecular crystals. The results are presented, and the strong coupling of the 31475 cm^{-1} exciton in naphthalene to the photon field is demonstrated to dictate the second-order nonlinear behavior of naphthalene crystals at frequencies near half-resonance. The dynamics of polaritons produced coherently via nonlinear interactions which are dependent on phase matching is shown to deviate in a controllable way from the dynamics of the one-photon polaritons produced in a linear experiment. The nature of the excitation remains principally that of an exciton.

40920 (UCRL—53636) **Crystal class and the electrooptic effect.** Eimerl, D. (Lawrence Livermore National Lab., CA (USA)). May 1985. Contract W-7405-ENG-48. 22p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015240.

The propagation of light in linear electrooptic media is reviewed with emphasis on understanding the full effect of crystal symmetry. The changes in the refractive indexes and the rotation of the optic axes are calculated in detail for each of the 18 biaxial and

uniaxial crystal classes. The direction of the applied field and the ray propagation are unrestricted. Under these circumstances, there is no apparent reason to prefer crystals from any particular class. However, in applications requiring large-aperture electrooptic devices, there is an advantage to applying the field parallel to the ray direction. Then the most attractive crystal classes are m, mm2, 4, 4mm, 4, 42m, 23, 43m, 6, and 6mm. These crystal classes allow propagation along an optic axis, generate birefringence with the applied field parallel to the optic axis and ray direction, and are incapable of rotating the index ellipsoid. Materials from these classes will provide robust electrooptic switches at large aperture.

40921 **Viscosity and steady shocks.** Moss, W.C. (University of California, Lawrence Livermore National Laboratory, Livermore, California 94550). *Applied Physics Letters;* **47**: No. 4, 372-373(15 Aug 1985). Contract W-7405-ENG-48.

The dependence of the strain rate on the Hugoniot stress and the effective viscosity is derived for steady wave propagation, by considering the balance between viscous and driving forces in the steady wave. The strain rate in elastic-plastic solids is shown to vary as the fourth power of the Hugoniot stress, which is in agreement with experimental data.

40922 **Collective multipole excitations in small metal particles: Critical angular momentum l/sup cr/ for the existence of collective surface modes.** Ekardt, W. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831 and Fritz-Haber-Institut der Max-Planck-Gesellschaft, Faradayweg 4-6, D-1000 Berlin West 33, West Germany). *Physical Review* [*Section*] *B: Condensed Matter;* **32**: No. 4, 1961-1970(15 Aug 1985).

The electronic multipole response properties of small metal particles are investigated within the frame of a self-consistent spherical jellium model. The method used is the time-dependent local-density approximation (TDLDA), which was used before in a study of the dipole response [W. Ekardt, Phys. Rev. Lett. 52, 1925 (1984)]. On comparing the TDLDA response with the response of a system of noninteracting electrons, we see clearly how the electron-electron interaction is switched off rather suddenly around a critical angular momentum l/sup cr/. It is shown that the value of l/sup cr/ can be obtained from the equation q/sup cr/ = l/sup cr//R, where R is the radius of the jellium background and q/sup cr/ is the critical wave vector of the planar jellium surface. This result is consistent with a result found earlier for l = 1 [W. Ekardt, Phys. Rev. B 31, 6360 (1985)]: A spherical surface behaves across the jellium edge like a patch of a planar jellium surface.

40923 **Total-energy differences and eigenvalue sums.** Weinert, M.; Watson, R.E.; Davenport, J.W. (Department of Physics, Brookhaven National Laboratory, Upton, New York 11973). *Physical Review* [*Section*] *B: Condensed Matter;* **32**: No. 4, 2115-2119(15 Aug 1985). Contract AC02-76CH00016.

We derive a variational expression for the total-energy difference between two crystal structures in terms of the difference in the sum of the one-electron eigenvalues and additional exchange-correlation and Coulomb contributions. These terms can be made to vanish under certain approximations, but for compound formation and for changes in volume, these terms can be of significance. Our derivation clearly shows that it is the same density, not the same potential as is commonly asserted, that is used in calculating the eigenvalue sums of the two structures; this formal distinction is of importance in order to maintain the variational nature of the results. Our results provide a framework in which many commonly used expressions can be justified and generalized.

40924 **Low-temperature Peltier heat of an itinerant electron in a ferromagnetic semiconductor.** Liu, N.H.; Emin, D. (Department of Physics, University of California at Riverside, Riverside, California 92521). *Physical Review* [*Section*] *B: Condensed Matter;* **32**: No. 4, 2285-2290(15 Aug 1985).

The Peltier heat of a wide-band itinerant carrier in a ferromagnetic semiconductor has been calculated for temperatures below the Curie temperature. In this regime we treat the spin fluctuations within the spin-wave approximation. The coupling of the charge carrier to the local moments is via local intra-atomic (e.g., s-f or s-d) exchange. Taking the strength of the intra-atomic exchange interaction to be small compared with the carrier's electronic bandwidth, we treat the interaction between the carrier and the local moments perturbatively through second order. We use the perturbed energy to compute the free energy of the coupled electron-magnon system. From the carrier-induced change of the system's free energy we directly obtain the carrier's Peltier heat. The Peltier heat contains two terms of opposite sign which both increase in magnitude with increasing temperature. These two terms arise from the first- and second-order contributions to the energy of the coupled system. Except at very low temperatures, the first-order contribution dominates. Then the electron-magnon interaction provides a negative contribution to the Peltier heat of a ferromagnetic semiconductor. The magnitude of this contribution varies as T/sup 3/2/.

40925 **Theory of elastic wave scattering: Applications of the method of optimal truncation.** Opsal, J.L.; Visscher, W.M. (Therma-Wave, Inc., 47734 Westinghouse Drive, Fremont, California 94539). *Journal of Applied Physics;* **58**: No. 3, 1102-1115(1 Aug 1985).

The method of optimal truncation is developed and applied to a variety of rotationally symmetric defects in elastic materials. Results are presented for oblate and prolate spheroidal voids, cracks, irregularly shaped voids, and compound inclusions. Most of the examples are in the frequency domain, but samples of time-domain calculations are included. Physical interpretations of some features of the calculated amplitudes are given. Checks on accuracy of the results are emphasized and implemented.

40926 **Geometric statistics and dynamic fragmentation.** Grady, D.E.; Kipp, M.E. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Journal of Applied Physics;* **58**: No. 3, 1210-1222(1 Aug 1985).

The present study is focused on the distributions in particle size produced in dynamic fragmentation processes. Previous work on this subject is reviewed. We then examine the one-dimensional fragmentation problem as a random Poisson process and provide comparisons with expanding ring fragmentation data. Next we explore the two-dimensional (area) and, less extensively, the three-dimensional (volume) fragmentation problem. Mott's theory of random area fragmentation is developed, and we propose an alternative application of Poisson statistics which leads to an exponential distribution in fragment size. Both theoretical distributions are compared with analytic and computer studies of random area geometric fragmentation problems, including those suggested by Mott, the Voronoi construction, a variation of the Johnson—Mehl construction, and several methods of our own. We find that size distributions from random geometric fragmentation are construction dependent, and that a conclusive choice between the two distributions cannot be made. A tentative application of the maximum entropy principle to fragmentation is discussed. The statistical theory is extended to include a concept of statistical heterogeneity in the fragmentation process. Finally, comparisons are made with various, dynamic fragmentation data.

40927 **Low-temperature phase of a stacked triangular Ising antiferromagnet.** Coppersmith, S.N. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review* [*Section*] *B: Condensed Matter;* **32**: No. 3, 1584-1594(1 Aug 1985). Contract AC02-76CH00016.

We have investigated a model consisting of planes of Ising spins withantiferromagnetic nearest-neighbor interactions on a triangular lattice connected by nearest-neighbor ferromagnetic bonds in the third direction. It is shown that Landau theory, mean-field theory, and conventional low-temperature expansions are not reliable for this model. We have also studied a class of one-dimensional frustrated Ising models which have low-temperature expansions with irrational coefficients, indicating that the usual method of counting excitations about ground-state configurations cannot be used to construct their low-temperature series. The results from the one-dimensional models are used to obtain bounds on the free energy and information about the magnetization of the three-dimensional model at low temperatures.

40928 **Nonlinear excitations on a quantum ferromagnetic chain.** Balakrishnan, R.; Bishop, A.R. (Department of Theoretical Physics, University of Madras, Guindy Campus, Madras 600025, India). *Physical Review Letters;* **55**: No. 5, 537-540(29 Jul 1985).

We use a spin-coherent representation to derive the spectrum of nonlinear excitations in a spin-S quantum ferromagnetic Heisenberg chain in the continuum limit. Quantum effects split the semiclassical spectrum into two branches: a lower branch of spin-wave-like, large-width solitary waves with negligible quantum corrections for all S, and an upper branch of particlelike, small-width solitary waves subject to significant quantum corrections for low S. The stability of these excitations is briefly discussed.

40929 **Molecular dynamics studies of superionic conductors.** Rahman, A.; Vashishta, P. (Argonne National Lab., IL). pp 93-142 of Physics of superionic conductors and electrode materials. Perram, J.W. (ed.). New York, NY; Plenum Publishing Corporation (1983).

Structural and dynamical properties of superionic conductors AgI and CuI are studied using molecular dynamics (MD) techniques. The model of these superionic conductors is based on the use of effective pair potentials. To determine the constants in these potentials, cohesive energy and bulk modulus are used as input: in addition one uses notions of ionic size based on the known crystal structure. Salient features of the MD technique are outlined. Methods of treating long range Coulomb forces are discussed in detail. This includes the manner of doing Ewald sum for MD cells of arbitrary shape. Features that can be incorporated to expedite the MD calculations are also discussed. A novel MD technique which allows for a dynamically controlled variation of the shape and size of the MD cell is described briefly. The development of this novel technique has made it possible to study structural phase transitions in superionic conductors. 68 references, 17 figures, 2 tables.

6561 Superconductivity

REFER ALSO TO CITATION(S) 39486, 39491, 39508, 39509, 39566, 39575, 39576, 39577, 39586, 39587, 39632

40930 **(BNL—36647) Neutron scattering studies of the heavy Fermion superconductors.** Goldman, A.I. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 14p. (CONF-8505138—13). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014829.

From Materials and mechanisms of superconductivity conference; Ames, IA, USA (29 May 1985).

Recent neutron scattering measurements of the heavy Fermion superconductors are described. Those materials offer an exciting opportunity for neutron scattering since the f-electrons, which couple directly to magnetic scattering measurements, seem to be the same electrons which form the superconducting state below T/ sub c/. In addition, studies of the magnetic fluctuations in these, and other heavy Fermion systems, by inelastic magnetic neutron scattering can provide information about the nature of the low temperature Fermi liquid character of these novel compounds.

40931 **(IS-M—553) Josephson effect in the unusual superconductors $Lu_2Fe_3Si_5$, $LiTi_2O_4$, and UBe_{13}.** Wolf, E.L.; Noer, R.J.; Han, S.; Ng, K.W.; Chen, T.P.; Finnemore, D.K.; Tanner, L. (Ames Lab., IA (USA)). 1985. Contract W-7405-ENG-82. 12p. (CONF-8505138—14). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015260.

From Materials and mechanisms of superconductivity conference; Ames, IA, USA (29 May 1985).

A Josephson supercurrent, which can be split by microwave photons of frequency nu into Shapiro steps of spacing $\Delta V = hnu/2e$, is expected between superconductors of like pairing type, either s or p-wave. A weaker, and possibly unobservable effect, with step spacing $\Delta V/2$ was predicted by Pals and van Haeringen between electrodes of unlike pairing type. Experiments using K-band microwaves and a Nb point contact have been carried out at 1.2 K on the d-band superconductors $LiTi_2O_4$ and $Lu_3Fe_5Si_5$. In both cases we find unambiguous indication of s-wave pairing, as in Nb. The same experiment on the heavy-fermion superconductor UBe_{13} in the range 0.7 K to 7 K also reveals steps of spacing ΔV. This indicates that UBe_{13} has been induced into a state of s-wave superconductivity by proximity with the s-wave superconductor Nb.

6570 Theoretical Physics

REFER ALSO TO CITATION(S) 39738, 40793, 40856, 40857, 40952, 41087

40932 **(CEA-N—2406, pp 162-167) Damped harmonic oscillator model, revisited.** Brancus, I.; Dorobantu, I.A.; Brancus, D.E.N. 1984. NTIS (US Sales Only), PC A09/MF A01. File Number DE85751948. (CONF-8405179—).

From International conference on theoretical approaches to heavy ion reaction mechanisms; Paris, France (14 May 1984).

Different alternatives of the damped harmonic oscillator model, widely used in many domains of physics have in common the same schematic way of dealing with the reservoir characterized by infinite bandwidth, infinite lifetimes of the elementary excitations and a flat density of states close to the relevant oscillator frequency. This paper treats more realistically the reservoir, by giving up the above restrictions and considering, in a non-Markoffian frame, their effects on the evolution of the oscillator states.

40933 **(CTOM—49097) Problem of uniqueness of equilibrium stationary general relativistic fields.** Savage, J.R. (Alberta Univ., Edmonton (Canada). Dept. of Physics). 1980. 165p. Canadian Theses on Microfiche Service, National Library of Canada, Ottawa, Canada K1A 0N4.

Thesis (Ph.D.).

That a self-gravitating equilibrium perfect fluid in empty space has a spherical configuration if it is nonrotating or has a unique configuration characterized by some physical parameters if it is slowly rotating is considered physically evident but has not been rigorously derived from Einstein's field equations together with suitably asymptotic conditions. The author considers the equations for a general relativistic stationary spacetime which is asymptotically flat and consists of an exterior vacuum solution and an interior perfect fluid in rigid motion with a given equation of state, total mass and surface temperature. Global analysis techniques are used to show that there is no family of such static spacetimes which depends differentiably on a parameter and contains the spherically symmetric solution except for families containing only solutions diffeomorphic to the spherically symmetric one. In the general stationary (rotating) case, if we require that the solutions be close to the static spherically symmetric ones we can show that there is at most a one-dimensional differentiable family of global axially symmetric solutions parameterized by the value of the angular momentum except for those obtained by coordinate transformation.

40934 **(IFVE-OTF—84-29) Algebra of asymptotic Poincare group generators in general relativity.** Solov'ev, V.O. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701722.

A criterion for realization of the Poincare group at spatial infinity, which is invariant in the choice of the coordinate system on hypersurfaces, is found in GR Hamiltonian formalism. We propose to use this criterion for a new definition of the asymptotic flatness of the initial data and the space-time. The background flat metric on hypersurfaces and the Poincare group, which conserves this metric, are defined ambigously. However, the numerical values of the generators are independent of the freedom of this choice on constraint solutions. In the case of an asymptotically Galilean metric, a refinement for the widely used boundary conditions has been obtained. A recipe for the use of the Arnowitt-Deser-Misner decomposition, with the slowly decreasing contribution from the space and time coordinate transformations, is given. 14 references.

40935 **(IFVE-OTF—84-38) Invariant for radiation transition in the Coulomb field.** Alliluev, S.P.; Gershtejn, S.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701719.

There has been found an invariant for a classical particle motion in the Coulomb field for the case, when radiation friction is present. 1 reference.

40936 **(IFVE-OTF—84-86) Dependent coordinates in classical mechanics.** Razumov, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1984. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701720.

A method for using dependent coordinates in classical mechanics based on the idea of pseudoinverse matrix is suggested. The idea of pseudoinverse matrix is discussed, and its existence is proved. 6 references.

40937 **(JINR—R-5-84-541) Covariant Bogolyubov transformation and quantum excitation of real solitons.** Meshcheryakov, D.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1984. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701721.

Quantization of the solutions of nonlinear classical equations with real soliton solutions is investigated. Nonlinear complex scalar field in two-dimensional space-time is considered. The quantization is performed in the vicinity of classical solution. To account the Poincare invariance, the covariant Bogolubov transformation is used. Operators of secondary quantization satisfy the linkages imposed on state vectors. It is shown that quantum excitations of neutral classical solution in nonlinear models do not possess conservation values additional in relation to classical solutions. Quantum field in nonlinear model cannot have a higher symmetry type than that one of the classical solution. 9 references.

40938 **(JINR—R-18-84-403) Role of gravitation in the existence of an electric charge and its magnetic moment. Dynamics.** Zorin, G.N. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1984. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701723.

In order to clarify the role of gravitation in forming a microcosmos and as a result of generalization of the principle of intertia relativity a three-dimensional space-time is obtained which posseses groups of isometries including Lorentz transformations. Such space-time contains a new dimension which size, as established, unlike the dimensions of two other dimensions-length and time-, is radian. It is established that conservation of forces of gravitational effect of Metagalaxy upon a material point (mp) at its motion during the shortest time is responsible for relativistic scaling change. It is substantiated that without introducing a new concept energy moment of mp it is impossible to establish a physical content both of electric and gravitational charges. It is proved that the existence itself of electric charge and of its magnetic moment is caused by gravitational influence of Metagalaxy on mp. It is discovered that the gravitational interaction of mp with Metagalaxy is an independent interaction which neglect, as clarified, causes the divergence by an order of values of Galaxy clusters masses determined by the Newton law of gravitation and by galaxies luminosity. Using of the formulated mechanics for a number of physical phenomena considered in quantum electrodynamics is discussed. 11 references.

40939 **(LA—10404-MS) Plane-wave theory of electrical transport in disordered systems.** Rinker, G. (Los Alamos National Lab., NM (USA)). May 1985. Contract W-7405-ENG-36. 20p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015353.

This is the third in a series of reports concerning the electrical and thermal transport properties of dense plasma. In the present work we construct a plane-wave theory that approximates, with moderate success, our previous partial-wave calculations of electrical and thermal transport coefficients. Regions of validity are indicated. Comparisons are made with experimental measurements of source libraries that contain the transport coefficients calculated by the present method for all elements from $Z = 1$ to $Z = 96$.

40940 **(OUP—83-03) Quantum-like methods of solution for classical dynamical equations.** Kolsrud, M. (Oslo Univ. (Norway). Fysisk Inst.). Jan 1983. 29p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701692.

The general solution of Hamilton's equation is obtained from the unperturbed solution through a series expansion in terms of the interaction Hamiltonian. An equivalent classical transformation operator in phase space is established. The method is applied to particles and/or fields. Poissons brackets for the free dynamical variables are evaluated. The quantized version is formally similar to these classical results. It is thus obtained directly, giving the time dependent Heisenberg-variables, and also the unitary transformation operators, in particular for the case of QED. Some consequences of the use of +- commutators are discussed.

40941 **(UCRL—92255) Dislocation kinetics behind shear shocks.** Stout, R.B.; Anderson, G.D. (Lawrence Livermore National Lab., CA (USA)). Jun 1985. Contract W-7405-ENG-48. 6p. (CONF-850736—24). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014811.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

High velocity oblique impact experiments result in both compression and shear shock waves. Behind the shear shock wave the particle velocity is transverse to the shock front. At large transverse particle velocities, dislocation kinetics can contribute a portion of the velocity. Based on a kinematic and thermodynamic model of dislocation kinetics, an analysis is made of the transverse strain and velocity behind a shear shock. Kinematics of dislocations in transverse motion behind the shock is formulated. A solution is given for an ideal case where the dislocation density function propagates as a pulse behind the shear shock. 9 refs.

40942 **(USIP—84-03) Three lectures on supersymmetry and supergravity.** Lindstroem, U. (Stockholm Univ. (Sweden). Inst. of Physics). Mar 1984. 41p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701693.

Supersymmetry is introduced through a simple worked example. Supersymmetric theories are then reviewed with particular emphasis on supergravity.

40943 **Comment on the consistency of truncated nonlinear integral equation based theories of freezing.** Cerjan, C.; Bagchi, B.; Rice, S.A. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *Journal of Chemical Physics;* **83**: No. 5, 2376-2383(1 Sep 1985).

We report the results of two studies of aspects of the consistency of truncated nonlinear integral equation based theories of freezing: (i) We show that the self-consistent solutions to these nonlinear equations are unfortunately sensitive to the level of truncation. For the hard sphere system, if the Wertheim—Thiele representation of the pair direct correlation function is used, the inclusion of part but not all of the triplet direct correlation function contribution, as has been common, worsens the predictions considerably. We also show that the convergence of the solutions found, with respect to number of reciprocal lattice vectors kept in the Fourier expansion of the crystal singlet density, is slow. These conclusions imply great sensitivity to the quality of the pair direct correlation function employed in the theory. (ii) We show the direct correlation function based and the pair correlation function based theories of freezing can be cast into a form which requires solution of isomorphous nonlinear integral equations. However, in the pair correlation function theory the usual neglect of the influence of inhomogeneity of the density distribution on the pair correlation function is shown to be inconsistent to the lowest order in the change of density on freezing, and to lead to erroneous predictions.

40944 **Quantum relativistic oscillator. II. Nonrelativistic limit and phenomenological justification.** Bohm, A.; Loewe, M.E.; Magnollay, P. (Center for Particle Theory, The University of Texas at Austin, Austin, Texas 78712). *Physical Review* [*Section*] *D: Particles and Fields;* **32**: No. 3, 791-799(1 Aug 1985).

It is shown that the quantum relativistic oscillator with noncommuting internal momentum and position has as its nonrelativistic contraction limit the usual three-dimensional oscillator. The nonrelativistic limits for representations with integer and half-integer spin are compared with the quark-model picture. The spectrum pre-

dicted by the quantum relativistic oscillator with rotations is compared with experimental hadron spectra.

40945 **Circuit effect in $LiNbO_3$ channel-waveguide modulators.** Becker, R.A. (Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, Massachusetts 02173-0073). *Optics Letters;* **10**: No. 8, 417-419(Aug 1985).

An RC circuit is used to model transient effects that occur when dc or quasi-dc voltages are applied to channel-waveguide modulators. These effects are believed to be due to the anisotropic redistribution over time of charge stored in the $LiNbO_3$. The anisotropy arises from the anisotropic material properties and the inhomogeneity induced when channel waveguides are formed. The transient effects measured are not caused by photorefractivity.

40946 **Sensitive dependence on parameters in nonlinear dynamics.** Farmer, J.D. (Center for Nonlinear Studies, MS B258, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review Letters;* **55**: No. 4, 351-354(22 Jul 1985).

Two qualitatively different types of dynamical behavior can be so tightly interwoven that it becomes impossible predict when a small change in parameters will cause a change in qualitative properties. For quadratic mappings of the interval, for example, the chaotic to parameter values form a Cantor set of positive measure, broken up by periodic intervals. This set can be described by a global scaling law, which makes it possible to form a good estimate of the fraction of chaotic parameter values. Sensitive dependence on parameters occurs when the scaling exponent $\beta < 1$. β is conjectured to display universal behavior.

40947 **Approximation scheme for the quantum Liouville equation using phase-space distribution functions.** Ploszajczak, M.; Rhoades-Brown, M.J. (Niels Bohr Institute, Blegdamsvej 17 DK-2100 Copenhagen O, Denmark and Physics Department, State University of New York at Stony Brook, Stony Brook, New York 11794). *Physical Review Letters;* **55**: No. 2, 147-149(8 Jul 1985). Contract AC02-76ER13001.

A general approximation scheme for solving the quantum Liouville equation has been developed and is presented here specifically within the Hartree approximation. This method uses the connection between the density matrix and the Wigner phase-space representations. By use of the Wigner representation the off-diagonal elements of the density matrix are expanded in powers of deviations from the mean momentum value. The time evolution of these deviations is governed by a closed self-consistent set of equations.

40948 **Fourier path-integral Monte Carlo methods: Partial averaging.** Doll, J.D.; Coalson, R.D.; Freeman, D.L. (Chemistry Division, Mail Stop G-738, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review Letters;* **55**: No. 1, 1-4(1 Jul 1985).

Monte Carlo Fourier path-integral techniques are explored. It is shown that fluctuation renormalization techniques provide an effective means for treating the effects of high-order Fourier contributions. The resulting formalism is rapidly convergent, is computationally convenient, and has potentially useful variational aspects.

40949 **Macroscopic global modeling of binary alloy solidification processes.** Alexiades, V.; Wilson, D.G.; Solomon, A.D. (Oak Ridge National Laboratory). *Quarterly of Applied Mathematics;* **43**: No. 2, 143-158(Jul 1985). Contract W-7405-ENG-26.

A macroscopic mathematical model is constructed describing the evolution of the phases of a binary alloy or mixture undergoing solidification under the action of simultaneous conduction of heat and diffusion of solute. The formulation is global, in the form of a pair of conservation laws valid over the whole region occupied by the alloy in a weak (distributional) sense. Thus it is especially convenient for numerical solution since it does not require tracking of the interface, which, in fact, may develop into a "mushy zone".

40950 **Mode-locking and the transition to chaos in dissipative systems.** Bak, P.; Bohr, T.; Jensen, M.H. (Brookhaven National Lab., Upton, NY). *Physica Scripta;* **T9**: 50-58(1985). (CONF-8406186—). Contract AC02-76CH00016.

From 59. Nobel symposium - the physics of chaos and related phenomena; Graeftavallen, Sweden (11 Jun 1984).

The transition to chaos by the interaction and overlap of mode-locked resonances in dissipative systems with two competing frequencies is investigated theoretically by analyzing discrete circle maps, the differential equations representing real physical systems such as resistively shunted Josephson junctions and charge-density waves in RF fields), and two-dimensional discrete dissipative maps. The mode-locked intervals are found to trace a complete Devil's Staircase at the critical line where the map becomes noninvertable, and the complementary set of the Staircase is shown to be a Cantor set of universal fractal dimension 0.87. The equation for a damped driven pendulum is considered as an analogy to the Josephson and charge-density-wave cases, and it is inferred that the critical behavior of these systems is the same, permitting the experimental testing of theoretical predictions based on circle maps. Some published experimental data supporting the present predictions are surveyed. 29 references.

6580 Mathematical Physics

REFER ALSO TO CITATION(S) 40493, 40948, 41088

40951 **(ANL/MCS-TM—51) Some remarks on inverses of sparse matrices.** Duff, I.S.; Erisman, A.M.; Gear, C.W.; Reid, J.K. (Argonne National Lab., IL (USA)). Apr 1985. Contract W-31-109-ENG-38;AC02-76ER02383. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015509.

We discuss some properties of the structure of the inverse of a sparse matrix. In particular, we show that the structural inverse of an irreducible sparse matrix is always full. We first show that Gaussian elimination always yields a full structural inverse and then show the result directly. We believe that our lemmas concerning Gaussian elimination are of interest in their own right.

40952 **(DOE/ER/03992—569) Representations of the group of diffeomorphisms in the physics of particles, gravity and fluids.** Ne'eman, Y. (Texas Univ., Austin (USA). Center for Particle Theory; Ministry of Science and Development, Jerusalem (Israel)). Oct 1984. Contract AS05-76ER03992. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85007031.

The group of space-time diffeomorphisms is defined. The discovery of its double-covering group is reviewed and its representations are mentioned. Applications in several domains of physics are discussed.

40953 **(EUR-CEA-FC—1241) Asymptotic expansions of solutions of an nth order linear differential equation with power coefficients.** Paris, R.B.; Wood, A.D. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Recherches sur la Fusion Controlee). Nov 1984. 29p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85751995.

The asymptotic expansions of solutions of a class of linear ordinary differential equations of arbitrary order n, containing a factor zsup(m) multiplying the lower order derivatives, are investigated for large values of z in the complex plane. Four classes of solutions are considered which exhibit the following behaviour as $|z| \to \infty$ in certain sectors: (i) solutions whose behaviour is either exponentially large or algebraic (involving $p\ (< n)$ algebraic expansions), (ii) solutions which are exponentially small (iii) solutions with a single algebraic expansion and (iv) solutions which are even and odd functions of z whenever $n+m$ is even. The asymptotic expansions of these solutions in a full neigbourhood of the point at infinity are obtained by means of the theory of the solutions in the case $m=0$ developed in a previous paper.

40954 **(LA-DC—9486) Approximately Lorentz transformations and p-adic fields.** Beyer, W.A. (Los Alamos National Lab., NM (USA)). 12 Mar 1968. Contract W-7405-ENG-36. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015053.

Hyers and Ulam have discussed an ϵ-linear transformation f of a Banach space E over a real or complex field into itself $f(x + y) - f(x) - f(y) < \epsilon$ for all x and y in E, (fixed ϵ) and shown there exists uniquely a strictly linear transformation l: $E \rightarrow E$ for which $l(x) - f(x) < \epsilon$ for all x in E. Everett and Ulam have discussed Lorentz transformations in a produce space K/sup n+1/, where K is a non-Archimedean valued field. The purpose of this note is to extend the Hyers-Ulam theory to Banach spaces over p-adic number fields and to discuss analogous theorems for Lorentz transformations in both the real and p-adic cases. 4 refs.

40955 **Renormalization, unstable manifolds, and the fractal structure of mode locking.** Cvitanovic, P.; Jensen, M.H.; Kadanoff, L.P.; Procaccia, I. (Laboratory of Atomic and Solid State Physics, Cornell University, Ithaca, New York, 14853). *Physical Review Letters;* **55**: No. 4, 343-346(22 Jul 1985). Contract AC02-83ER13044.

The apparent universality of the fractal dimension of the set of quasiperiodic windings at the onset of chaos in a wide class of circle maps is described by construction of a universal one-parameter family of maps which lies along the unstable manifold of the renormalization group. The manifold generates a universal "devil's staircase" whose dimension agrees with direct numerical calculations. Applications to experiments are discussed.

40956 **Accuracy conditions for the numerical computation of waves.** Bayliss, A.; Goldstein, C.I.; Turkel, E. (Exxon Corporate Research, Annandale, New Jersey 08801). *Journal of Computational Physics;* **59**: No. 3, 396-404(Jul 1985). Contract AC02-76CH00016.

The Helmholtz equation $(\Delta + K^2n^2)u = f$ with a variable index of refraction n and a suitable radiation condition at infinity serves as a model for a wide variety of wave propagation problems. Such problems can be solved numerically by first truncating the given unbounded domain, imposing a suitable outgoing radiation condition on an artificial boundary and then solving the resulting problem on the bounded domain by direct discretization (for example, using a finite element method). In practical applications, the mesh size h and the wave number K are not independent but are constrained by the accuracy of the desired computation. It will be shown that the number of points per wavelength, measured by $(Kh)^{-1}$, is not sufficient to determine the accuracy of a given discretization. For example, the quantity K^3h^2 is shown to determine the accuracy in the L^2 norm for a second-order discretization method applied to several propagation models.

40957 **Construction of the Voronoi mesh on a sphere.** Augenbaum, J.M.; Peskin, C.S. (NASA-Goddard Space Flight Center, Code 611, Greenbelt, Maryland 20771). *Journal of Computational Physics;* **59**: No. 1, 177-192(Jun 1985). Contract AC02-76ER03077.

A new construction of the Voronoi mesh on the sphere is presented. The main feature is that the algorithm adds points one at a time until the final Voronoi mesh is built up. By adding one point to an existing Voronoi mesh of K points, only local changes are needed to construct a Voronoi mesh of K+1 points. This construction is particularly well suited to time-dependent problems since using information from the Voronoi mesh at the previous time step allows us to reduce the construction to O(N) operations when the two configurations are close, while the algorithm does not break down when they are far apart. Numerical experiments are presented to substantiate the O(N) operation count for a "typical" case.

40958 **Conservative rezoning algorithm for generalized two-dimensional meshes.** Ramshaw, J.D. (Theoretical Division, University of California, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Computational Physics;* **59**: No. 1, 193-199(Jun 1985).

A method is presented for transferring a conserved quantity Q from one generalized mesh to another when the volumetric density of Q is uniform within each cell of the original mesh.

6590 Communication, Education, History, And Philosophy

REFER ALSO TO CITATION(S) 40917

70 FUSION ENERGY

7001 Plasma Research

REFER ALSO TO CITATION(S) 40953, 41051, 41057

40959 **(CLM-R—246) Structure of the magnetic equilibrium in the HBTX1A reversed field pinch.** Brotherton-Ratcliffe, D.; Hutchinson, I.H. (UKAEA Culham Lab., Abingdon). Aug 1984. 23p. HMSO, London, price Pound 5.00.

The structure of the magnetic equilibrium in the Reversed Field Pinch HBTX1A has been measured using a magnetic probe inserted into the plasma. Variation of the measured flux-surface displacement with radius is consistent with that predicted by toroidal equilibrium theory. Profiles of the safety factor indicate that there is no pitch minimum. Pressure distributions are deduced which appear peaked on axis and are consistent with the measured values of the density and conductivity temperature. Values of β/sub Θ/ approx.= 14% and $<\beta>$ approx.= 5% are found, leading to an estimation of the energy confinement time of tau/sub E/ approx.= 70 μs. Electric field profiles are presented from which a profile of effective parallel conductivity is calculated.

40960 **(DOE/ER/53105—T2) Research and development of an aimed magnetic lead current density-magnetic field diagnostic. Final report.** (AMAF Industries, Inc., Columbia, MD (USA)). [1985]. Contract AC01-80ER53105. 76p. NTIS, PC A05. File Number DE85014720.

A diagnostics survey was made to provide a clear definition of advanced diagnostic needs and the limitations of current approaches in addressing those needs. Special attention was given to the adequacy with which current diagnostics are interfaced to signal processing/data acquisition devices and systems. Critical evaluations of selected alternative diagnostic techniques for future R and D activities are presented. The conceptual basis of the Aimed Magnetic Lead Gradiometric system as a current density/magnetic field diagnostic is established.

40961 **(DOE/ET—53088-194) Plasma kinetic theory in action-angle variables.** Mahajan, S.M.; Chen, C.Y. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Jun 1985. Contract FG05-80ET53088. 23p. (IFSR—194). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014767.

An appropriate canonical perturbation theory to correctly deal with general electromagnetic field perturbation is developed, and is used to set up plasma kinetic theory in action-angle variables. A variety of test problems are solved to show the unifying power of the method. Basic linear, quasilinear, and nonlinear equations are derived which can serve as the starting point for a whole range of plasma problems.

40962 **(DOE/ET/51013—140) Experimental studies of thermal and non-thermal electron cyclotron phenomena in tokamaks.** McDermott, F.S. (Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center). Dec 1984. Contract AC02-78ET51013. 395p. (PFC/RR—84-20). NTIS, PC A17/MF A01; GPO Dep. File Number DE85013650.

Thesis.

A direct measurement of wave absorption in the ISX-B tokamak at the second harmonic of the electron cyclotron frequency is reported. Measurements of the absorption of a wave polarized in the extraordinary mode and propagating perpendicular to the toroidal magnetic field are in agreement with the absorption predicted by the linearized Vlasov equation for a thermal plasma. Agreement is found both for an analytic approximation to the wave absorption and for a numerical simulation of ray propagation in toroidal geometry. Observations are also reported on a non-linear, three-wave interaction process occurring during high power electron cyclotron

resonance heating in the Versator II tokamak. The measured spectra and the threshold power are consistent with a model in which the incident power in the extraordinary mode of polarization decays at the upper hybrid resonance layer into a lower hybrid wave and an electron Bernstein wave. Finally, measurements of non-thermal emission at the second harmonic of the electron cyclotron frequency and below the electron plasma frequency are reported from low density, non-Maxwellian plasma in the Versator II tokamak. The emission spectra are in agreement with a model in which waves are driven unstable at the anomalous Doppler resonance, while only weakly damped at the Cerenkov resonance.

40963 (DOE/ET/51013—148) MHD stabilization of high β mirror plasma partially enclosed by conducting wall. Li, X.Z.; Kesner, J.; Lane, B. (Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center). Apr 1985. Contract AC02-78ET51013. 23p. (PFC/CP—85-2; CONF-850474—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015579.

From Sherwood theory conference; Madison, WI, USA (15 Apr 1985).

An MHD formulation is used to study a wall stabilized high β mirror plasma with isotropic pressure. The stabilizing wall extends axially only a part of the distance between the mirror midplane and throat. We model this arrangement using a wall that approaches the plasma surface in the bad curvature region and is distant from the plasma in the good curvature region. A variational method is used to solve the equation in the distant wall region and an iterative method is used to solve the equation when the wall is close to the plasma. A jump condition is used to connect the regions of close and distant plasma-wall proximity. A simple trial function is used to perform the variational calculation (the choice of trial function is substantiated by an exact numerical solution). The results show that for a low mirror ratio case more conducting wall surface is needed for stability than in the high mirror ratio case. This agrees with the physical mechanism of the wall stabilization.

40964 (DOE/ET/53088—188) Ambipolarons: solitary wave solutions for the radial electric field in a plasma. Hastings, D.E.; Hazeltine, R.D.; Morrison, P.J. (Oak Ridge National Lab., TN (USA); Texas Univ., Austin (USA). Inst. for Fusion Studies). Jun 1985. Contract FG05-80ET53088. 21p. (IFSR—188). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014764.

The ambipolar radial electric field in a nonaxisymmetric plasma can be described by a nonlinear diffusion equation. This equation is shown to possess solitary wave solutions. A model nonlinear diffusion equation with a cubic nonlinearity is studied. An explicit analytic step-like form for the solitary wave is found. It is shown that the solitary wave solutions are linearly stable against all but translational perturbations. Collisions of these solitary waves are studied and three possible final states are found: two diverging solitary waves, two stationary solitary waves or two converging solitary waves leading to annihilation.

40965 (EUR-CEA-FC—1229) Theoretical and experimental study of Gaussian beam and mode propagation in over-dimensioned circular guides. Crenn, J.P. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Recherches sur la Fusion Controlee; Paris-6 Univ., 75 (France)). Jun 1984. 209p. (In French). NTIS (US Sales Only), PC A10/MF A01. File Number DE85751932.

A theoretical study of modes in circular hollow over-dimensioned waveguides is developed; it shows the interest of dielectric or weakly conducting wall guide use. An optical model computing the transmitted power of gaussian beams through these guides, for different types of walls, is established. The formulas obtained allow to optimize the guide and to adapt the beam. Applied to the EH_{11} mode this optical model leads to new results. Systematical measurements of gaussian beam propagation in over-dimensioned guides are realised; they are concerned with beam power transmission, polarization, its structure and its radiation at the guide exit in function of the different characteristics of the beam and the guide.

40966 (IAE—3775/6) Study on vacuum magnetic configurations in a six-period geodesic screw tore. Glagolev, V.M.; Dobryakov, A.V.; Trubnikov, B.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1983. 36p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701757.

A method for calculation of vacuum magnetic fields, surfaces, pit and shear based on numerical determination of coefficients in analytical formulae approximating the field of the system of discrete conductors with current is suggested for an arbitrary closed trap. The method is exemplified by a geodesic screw tore. Besides, an optimum variant of the system of stabilizing windings ensuring plasma stability by the Mersje criterion at the maximum equilibrium pressure is disclosed for configuration with screw symmetry. 8 references, 9 figures, 3 tables.

40967 (IAE—3779/6) Model of impurity diffusion in tokamaks. Dnestrovskij, Yu.N.; Strizhov, V.F. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1983. 31p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701758.

Some aspects of simulation of impurity behaviour in tokamaks are considered. The diffusion model comprises both neaclassical and anomalous flows. A numerical algorithm for solving the problem is described. Some results of calculations of impurity diffusion and radiation in the installation T-10 are presented. 40 references, 5 figures, 1 table.

40968 (IAE—3793/6) Turbulent relaxation of directional energy of supersonic plasma flows in a longitudinal magnetic field. Alipchenkov, V.M.; Konkashbaev, I.K.; Lopatko, V.B. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1983. 24p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701759.

Collisionless relaxation of directional energy of supersonic plasma magnetized flows in a longitudinal magnetic field is considered in the paper. Moderation of supersonic plasma flows due to effective collisionless mechanism of interaction resulting from development of hose instability is numerically considered. 16 references, 10 figures.

40969 (INIS-mf—4754-No.27) International bulletin on atomic and molecular data for fusion. No. 27. Hughes, J.G. (ed.). (International Atomic Energy Agency, Vienna (Austria). Atomic and Molecular Data Unit). Dec 1984. 70p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85781266.

This bulletin deals with atomic and molecular data for fusion. A bibliography for the most recent relevent data, summarized in the document, is provided (373 literature pieces). Work in progress on the ionization by electron impact (theoretical results) is also briefly reported on.

40970 (IPPJ—644) Dissipation of magnetic energy during disruptive current termination. Yamazaki, K.; Schmidt, G.L. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Sep 1983. 19p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701298.

The magnetic coupling during a disruption between the plasma and the various coil systems on the PDX tokamak has been modeled. Using measured coil currents, the model indicates that dissipation of magnetic energy in the plasma equal to 75% of the energy stored in the poloidal field of the plasma current does occur and that coupling between the plasma and the coil systems can reduce such dissipation. In the case of PDX ohmic discharges, bolometric measurements of radiation and charge exchange, integrated over a disruption, account for 90% of the calculated energy dissipation.

40971 **(ITEF—11(1984)) Equilibrium states of radiative Z-pinch.** Bobrova, N.A.; Razinkova, T.L. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1984. 35p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85781040.

The problem on equilibrium of a cylindrically symmetric Z-pinch with account of radiation losses in deuterium-xenon mixture is considered. Radial distributions of equilibrium plasma density, plasma temperature and magnetic field intensity for various laws of radiative energy losses are obtained. In case of recombination radiation and line radiation for the given total current and plasma column radius the equilibrium plasma density has been found. In case of bremsstrahlung, the current at which equilibrium is possible, has been found.

40972 **(ITF—83-167-R) Radiation of non-uniform plasma ball.** Gvozdetskij, V.S.; Zagorodnij, A.G.; Krivtsun, I.V.; Yakimenko, I.P. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1983. 26p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE85701756.

The solution of the problem of thermal radiation is obtained for the case of non-uniform spherically-symmetric plasma system approximated by an arbitrary number of uniform spherical layers. Plasma is described within the framework of hydrodynamic model with gas kinetic pressure of electrons and dynamics of molecular sub-system. 14 references.

40973 **(LA-UR—85-225) Nondispersive x-ray diagnostics of short lived plasmas.** Day, R.H. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 50p. (CONF-8307156—1). NTIS, PC A03/MF A01; GPO Dep. File Number DE85005964.

From NATO advanced study institute; Pascoli, Italy (1 Jul 1983).

In this NATO Advanced Study Institute, we have discussed in detail the diagnosis of many pulse power machine properties, including their electrical behavior, grounding and shielding, and related data acquisition techniques. The purpose for many of these machines is to create high temperature/high density plasmas and, therefore, the subsequent behavior of these plasmas is of critical concern. The energy density of these plasmas is such that they will naturally radiate in the x-ray regime and thus the diagnosis of their x-ray emission is a crucial measurement of the entire system performance. In this lecture, I describe the general techniques used to perform nondispersive x-ray diagnostics of these short lived plasmas.

40974 **(LA-UR—85-226) High energy x-ray diagnostics of short lived plasmas.** Day, R.H. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 15p. (CONF-8307156—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85005963.

From NATO advanced study institute; Pascoli, Italy (1 Jul 1983).

High energy x-ray and gamma ray measurements are a common diagnostic of high temperature/high density plasmas. We will define high energy as those energies above 50 kilovolts and discuss the various techniques for returning temporal, spectral, and spatial distributions of this emission.

40975 **(ORNL/TM—9363) Theory of resistivity-gradient-driven turbulence.** Garcia, L.; Diamond, P.H.; Carreras, B.A.; Callen, J.D. (Oak Ridge National Lab., TN (USA)). Jul 1985. Contract AC05-84OR21400. 63p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85015068.

A theory of the nonlinear evolution and saturation of resistivity driven turbulence, which evolves from linear rippling instabilities, is presented. The nonlinear saturation mechanism is identified both analytically and numerically. Saturation occurs when the turbulent diffusion of the resistivity is large enough so that dissipation due to parallel electron thermal conduction balances the nonlinearly modified resistivity gradient driving term. The levels of potential, resistivity, and density fluctuations at saturation are calculated. A combination of computational modeling and analytic treatment is used in this investigation.

40976 **(ORNL/TM—9531) Spectral method for obtaining three-dimensional magnetohydrodynamic equilibria.** Hirshman, S.P.; Lee, D.K. (Oak Ridge National Lab., TN (USA)). Jul 1985. Contract AC05-84OR21400. 35p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015065.

A description is given of a new code, MOMCON (spectral moments with constraints), that obtains three-dimensional ideal magnetohydrodynamic (MHD) equilibria in a fixed toroidal domain using a Fourier expansion for the inverse coordinates (R,Z) representing nested magnetic surfaces. A set of nonlinear coupled ordinary differential equations for the spectral coefficients of (R,Z) is solved using an accelerated steepest descent method. A stream function λ is introduced to improve the mode convergence properties of the Fourier series for R and Z. Constraint equations relating the $m \geqq 2$ moments of R and Z are solved to define a unique poloidal angle.

40977 **(ORNL/TM—9598) Effects of trapped alpha particles on ballooning modes in tokamaks.** Spong, D.A.; Sigmar, D.J.; Cooper, W.A.; Hastings, D.E.; Tsang, K.T. (Oak Ridge National Lab., TN (USA)). Jul 1985. Contract AC05-84OR21400. 34p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015064.

The effects of a trapped, precessing alpha particle population on ballooning modes are examined for a large-aspect-ratio, shifted circular flux surface tokamak equilibrium. The alphas are modeled in the deeply trapped limit and with a Maxwellian distribution in energy. The resulting kinetic ballooning equation is solved numerically, and the dependence of the eigenvalues and stability boundaries on shear, background pressure gradient, and ratio of hot to background temperatures and densities is investigated. In the low-frequency regime ($\omega << \omega$/sub dH/ = alpha precessional drift frequency), the alpha component has a stabilizing influence, while in the intermediate-frequency range ($\omega \leqq \omega$/sub dH/) the alphas destabilize ballooning modes through interaction with the trapped particle precessional drift resonance. Parameter ranges that should be typical of alpha production in near-term tokamak devices such as the Tokamak Fusion Test Reactor (TFTR) are considered.

40978 **(OUP—84-24) Nonlinear saturation of E x B instability in a plasma slab.** Alfsen, K.H.; Holter, Oe. (Oslo Univ. (Norway). Fysisk Inst.). Sep 1984. 45p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781039.

The saturation of the E bar x B bar instability is investigated in the nonlinear regime. The governing equations are studied analytically and numerically by using a spectral method with mode truncation. The nonlinear stabilization is due to modifications of the background density- and potential profiles. In the time asymptotic limit a stationary solution, which is independent of the initial conditions is obtained. The asymptotic state is characterized by a splitting of the interacting modes into two almost non-interacting groups, where the modes with even mode number sum; i.e. the modes driven by the linearly most unstable mode, is found to dominate the system. For this group fixed point calculations are performed analytically with six interacting modes. Comparison with numerical calculations indicates excellent agreement far into the unstable region.

40979 **(OUP—84-28) Ion identification by ambipolar effusion from the positive column in a deuterium glow discharge.** Mentzoni, M. (Oslo Univ. (Norway). Fysisk Inst.). Nov 1984. 22p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781041.

The ambipolar ion effusion through a 100 *my*m hole in the wall of a sylindrical dishcarge vessel was analysed by a quadrupole mass spectrograph. The detected ion currents revealed that D*+sb+*, D+*sb3*, and D+*sb2* were present. Using the ambipolar theory for a multi-ionic plasma and published values for ion mobilities, density ratios were found for N(D+)/N(D+*sb3*). These ranged from 1.9 at p = 0.5 Torr to 1.1 at 1.3 Torr after having gone through a maximum of 2.8 at about 0.9 Torr.

40980 **(PPPL—2137) Fast ion profiles during neutral beam and lower hybrid heating.** Heidbrink, W.W.; Strachan, J.D.; Bell, R.E.; Cavallo, A.; Motley, R.; Schilling, G.; Stevens, J.; Wilson, J.R. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1985. Contract AC02-76CH03073. 15p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015308.

Profiles of the d(d,p)t fusion reaction are measured in the PLT tokamak using an array of collimated 3 MeV proton detectors. During deuterium neutral beam injection, the emission profile indicates that the beam deposition is at least as narrow as predicted by a bounce-averaged Fokker-Planck code. The fast ion tail formed by lower hybrid waves (at densities above the critical density for current drive) also peaks strongly near the magnetic axis.

40981 **(PPPL—2227) PBX experimental results in 1984.** Takahashi, H.; Bol, K.; Buchenauer, D.; Couture, P.; Fishman, H.; Fonck, R.; Grek, B.; Gammel, G.; Heidbrink, W.; Ida, K. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1985. Contract AC02-76CH03073. 42p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015309.

Experimental activities of the PBX project during its first seven months of operation are summarized.

40982 **(PPPL—2230) Parabolic approximation method for fast magnetosonic wave propagation in tokamaks.** Phillips, C.K.; Perkins, F.W.; Hwang, D.Q. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1985. Contract AC02-76CH03073. 39p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015310.

Fast magnetosonic wave propagation in a cylindrical tokamak model is studied using a parabolic approximation method in which poloidal variations of the wave field are considered weak in comparison to the radial variations. Diffraction effects, which are ignored by ray tracing mthods, are included self-consistently using the parabolic method since continuous representations for the wave electromagnetic fields are computed directly. Numerical results are presented which illustrate the cylindrical convergence of the launched waves into a diffraction-limited focal spot on the cyclotron absorption layer near the magnetic axis for a wide range of plasma confinement parameters.

40983 (PPPL—2233, pp 9-14) **Experiments on the ST Tokamak.** Stodiek, W. Jun 1985. NTIS, PC A05/MF A01. File Number DE85015311.

In Experimental research on toroidal devices at PPPL: 1960-1985.

The confinement time on the ST Tokamak was proportional to the plasma current and density, and reached values of 10 to 20 ms near the disruption limit. The confinement showed the effect of neoclassical, single-particle behavior for nonaxisymmetry. The Spitzer conductivity was found considering Z/sub eff/ from measured impurities. Runaway electron production was classical, the cross-field transport anomalous. The MHD modes, internal (sawtooth) and major disruptions, and island structures for the m = 2 modes were analyzed with soft x-ray imaging techniques. Ion-cyclotron heating at second harmonic operation increased the plasma temperature by 100 eV.

40984 (PPPL—2233, pp 15-21) **ATC tokamak.** Ellis, R.A. Jr. Jun 1985. NTIS, PC A05/MF A01. File Number DE85015311.

In Experimental research on toroidal devices at PPPL: 1960-1985.

The Adiabatic Toroidal Compressor (ATC) successfully demonstrated major-radius compression of ohmic and auxiliary-heated tokamak plasmas. Plasma densities well above 10^{14} cm^{-3} were reached, along with central ion and electron temperatures above 1 keV.

40985 (PPPL—2233, pp 22-29) **Princeton Large Torus (PLT).** Hosea, J.; Goldston, R.; Colestock, P. Jun 1985. NTIS, PC A05/MF A01. File Number DE85015311.

In Experimental research on toroidal devices at PPPL: 1960-1985.

In the PLT experimental program, ohmic, neutral-injection and ion-cyclotron heating techniques have been studied and improved, resulting in record ion temperatures. In addition, noninductive current-drive with lower-hybrid waves has been demonstrated. These achievements were made possible by the continual development and deployment of advanced plasma diagnostics, high-power rf systems, and specially-tailored materials and structures. The intermediate size of PLT has permitted flexible experimental operation and the separation of plasma core from plasma surface effects.

40986 (PPPL—2233, pp 30-35) **Poloidal Divertor Experiment (PDX) and the Princeton Beta Experiment (PBX).** Bol, K.; Okabayashi, M.; Fonck, R. Jun 1985. NTIS, PC A05/MF A01. File Number DE85015311.

In Experimental research on toroidal devices at PPPL: 1960-1985.

A review of high-power neutral-beam heating, impurity studies, and high-beta research on the PDX/PBX tokamak, is presented.

40987 (PPPL—2233, pp 36-39) **S-1 spheromak.** Yamada, M. Jun 1985. NTIS, PC A05/MF A01. File Number DE85015311.

In Experimental research on toroidal devices at PPPL: 1960-1985.

The S-1 device inductively generates spheromak plasmas with major radii of 40 to 65 cm and toroidal plasma currents up to 500 kA. The major objective is the investigation of MHD stability and transport characteristics of spheromaks that are stabilized in externally applied magnetic fields by loose-fitting conductors and coils.

40988 (PPPL—2233, pp 40-47) **Initial studies of confinement, adiabatic compression, and neutral-beam heating in TFTR.** Grove, D.J.; Meade, D.M. Jun 1985. NTIS, PC A05/MF A01. File Number DE85015311.

In Experimental research on toroidal devices at PPPL: 1960-1985.

The Tokamak Fusion Test Reactor (TFTR) is intended to achieve approximate energy breakeven in D-T plasmas. Construction approval was received in March 1976, and the first plasma was produced in December 1982. Three major experimental run periods, the last ending April 1985, have yielded experimental results on confinement and heating that extend the scaling laws of smaller machines. The plasma parameters in TFTR are now approaching those required for breakeven in unthermalized, two-component regimes. They span the range from high-density operation with n/sub e/(0)tau/sub E/ ~ 4 x 10^{19} m^{-3} s to a low-density regime with T/sub i/(0) ~ (9 +- 2) keV. The maximum product n/sub e/(0)tau/sub E/T/sub i/(0) of about 9 x 10^{19} m^{-3} s keV was obtained at a central density, 1.1 x 10^{20} m^{-3}, by means of pellet injection.

40989 **(RAL—84-057) Particle acceleration in space and laboratory plasmas.** Bingham, R.; Bryant, D.A.; Hall, D.S. (Rutherford Appleton Lab., Chilton (UK)). Jun 1984. 17p. (CONF-8406254—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701760.

From Canadian Association of Physicists annual meeting; Sherbrook, Canada (18 Jun 1984).

The general principle of charged particle acceleration in space and laboratory plasmas is illustrated by a discussion of particular types of acceleration mechanisms which can be classified as either deterministic processes or stochastic processes. Acceleration by parallel electric fields, produced in double layers is an example of a deterministic process. Fermi acceleration and acceleration by turbulent wave fields are examples of stochastic processes. The physical acceleration mechanism involved in each type of process is discussed and examples given for space and laboratory plasmas.

40990 **(UCRL—92160) Improved approach to characterizing and presenting streak camera performance.** Wiedwald, J.D.; Jones, B.A. (Lawrence Livermore National Lab., CA (USA)). 15 Jul 1985. Contract W-7405-ENG-48. 7p. (CONF-850887—8). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015188.

From SPIE international technical symposium on optical and electro-optical engineers; San Diego, CA, USA (18 Aug 1985).

The performance of a streak camera recording system is strongly linked to the technique used to amplify, detect and quantify the streaked image. At the Lawrence Livermore National Laboratory (LLNL) streak camera images have been recorded both on film and by fiber-optically coupling to charge-coupled devices (CCD's). During the development of a new process for recording these images (lens coupling the image onto a cooled CCD) the definitions of important performance characteristics such as resolution and dynamic range were re-examined. As a result of this development, these performance characteristics are now presented to the streak camera user in a more useful format than in the past. This paper describes how these techniques are used within the Laser Fusion Program at LLNL. The system resolution is presented as a modulation transfer function, including the seldom reported effects that flare and light scattering have at low spatial frequencies. Data are presented such that a user can adjust image intensifier gain and pixel averaging to optimize the useful dynamic range in any particular application.

40991 **Technique for in situ calibration of an x-ray streak camera in the nanosecond regime using a high density Z-pinch.** Jones, L.A.; Kallne, E.; Kania, D.R.; Maestas, M.; McGurn, J.S.; Shepherd, R. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Applied Physics;* **58**: No. 5, 1711-1714(1 Sep 1985).

A technique for calibrating an x-ray streak camera in situ has been developed. It has been applied to an x-ray streak camera installed on a collapsing gas shell Z-pinch. The calibration was done by simultaneously measuring the emitted x-rays using a pinhole camera, an InP:Fe photoconductive detector, and the streak camera. The spatial dimension of the streak image was calibrated by integrating the film density over time and fitting the resulting data to the corresponding information taken from an x-ray pinhole image. The temporal calibration was obtained by similarly fitting the film density from the x-ray streak image as a function of time integrated over the appropriate part of the spatial dimension with the signal from an InP:Fe photoconductive detector. By using this technique we have found a spatial magnification of the streak camera system consistent with the results derived from the geometrical optics to within 10%. A temporal dispersion of 2.5 +- 0.5 ns/mm was obtained, which is in agreement with the nominal speed of 2.5 ns/mm. This technique also yielded an absolute intensity calibration of the streak camera.

40992 **Proton ring trapping in a gated magnetic mirror.** Pedrow, P.D.; Greenly, J.B.; Hammer, D.A.; Sudan, R.N. (Laboratory of Plasma Studies, Cornell University, Ithaca, New York 14853). *Applied Physics Letters;* **47**: No. 3, 225-226(1 Aug 1985). Contract AC02-77ET53005.

An axis-encircling proton ring has been trapped for times (roughly-equal4 μs) much longer than the ion cyclotron period (roughly-equal80 ns). The rings, with mean radius 10 cm and with particle energies < or =430 keV, made eight passes through the 1.5-m-long magnetic mirror well with static and puffed hydrogen used for space-charge neutralization. The measured proton inventory was typically 2 x 10^{10} protons during the first pass and 2 x 10^{13} protons during the eighth and final pass. With a central solenoidal field of 0.8 T, the peak diamagnetism and azimuthal current density of the injected ring were typically 10 mT (100 G) and 10 A/cm^2, respectively.

40993 **Wave absorption at the second harmonic of the electron-cyclotron frequency in a tokamak plasma.** McDermott, F.S.; Bekefi, G.; England, A.C.; Attenberger, S.E.; Batchelor, D.B.; Edmonds, P.H.; Goldfinger, R.C.; Kindsfather, R.R.; Lazarus, E.A.; Murakami, M. (Department of Physics, Research Laboratory of Electronics and Plasma Fusion Center, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Physics of Fluids;* **28**: No. 8, 2625-2627(Aug 1985).

Wave absorption in the ISX-B tokamak [Phys. Rev. Lett. 44, 647 (1980)] at the second harmonic ($\omega = 2\omega$/sub c/e) of the electron-cyclotron frequency is reported. Measurements of the absorption of a wave polarized in the extraordinary mode and propagating perpendicular to the toroidal magnetic field are in agreement with computations.

40994 **Microchannel-plate intensified crystal spectrometer for use in soft x-ray spectroscopy.** Hailey, C.J.; Rockett, P.; Eckart, M.; Burkhalter, P.G. (KMS Fusion, Inc., 3621 South State Road, P.O. Box 1567, Ann Arbor, Michigan 48106-1567). *Review of Scientific Instruments;* **56**: No. 8, 1553-1556(Aug 1985). Contract AC08-82DP40152.

A Bragg crystal spectrometer, utilizing a microchannel plate coupled to optical film as the detection medium, has been constructed for use in soft x-ray spectroscopy. The sensitivity of this intensified gated camera to x-rays has been compared directly with standard x-ray film using a calibrated x-ray source. In addition, this high gain, intensified crystal spectrograph (ICS) has been used in an experiment to precisely measure spectral coincidences between x-ray lines in laser-generated plasmas, thus identifying candidates for photoresonant x-ray lasing schemes in the 10—21-A region. At long wavelengths the ICS was able to obtain useful data on faint lines in a single laser shot, rather than the multiple shots required by an adjacent spectrograph using x-ray film. It also allowed line coincidences to be verified by a new technique utilizing split disk targets. The design and construction of the ICS and results obtained with it are compared with those obtained with standard x-ray film.

40995 **Finite orbit analysis for long wavelength modes in a plasma with a hot component.** Hammer, J.H.; Berk, H.L. (Lawrence Livermore National Laboratory, Livermore, California 94550). *Physics of Fluids;* **28**: No. 8, 2442-2449(Aug 1985).

The z-pinch model is used to calculate finite Larmor radius effects of a plasma with a hot component plasma annulus. The equations are analyzed for layer modes and the finite Larmor radius stabilization condition is calculated. Stability requires k^2 rho^2/sub h/ Rβ/sub h//Δ> or $\approx$1, where k is the wavenumber in the z direction, rho/sub h/ the hot species Larmor radius, β/sub h/ the hot particle beta, and Δ the thickness of the pressure profile. In addition a new instability is found, caused by the interaction of the precessional modes associated with inner and outer edges of the hot particle pressure profile.

40996 **Magnetohydrodynamic equilibrium and stability of rotating field-reversed configurations with excluded multipole fields.** Spencer, R.L.; Tuszewski, M. (University of California, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physics of Fluids;* **28**: No. 8, 2510-2516(Aug 1985).

The rotational instability in field-reversed configurations (FRC's) is observed experimentally to be suppressed by the application of multipole fields. In this paper the equilibrium and stability of a FRC with multipole fields that do not penetrate into the plasma are studied. It is shown that two rotating magnetohydrodynamic (MHD) equilibria are possible for a long FRC in a multipole field. One is nearly circular while the other is cusp shaped. Experiments and hybrid simulations indicate that cusp-like equilibria are usually obtained. The effect of helical multipole fields on the equilibrium is also discussed. The stability of such a configuration has been previously studied by using the MHD model on a circular plasma and by using a hybrid simulation code. In the important quadrupole case, the two calculations disagree: the simulation shows that the mode is stabilized while the circular MHD calculation predicts that it remains unstable. A close look at the MHD calculation shows that stability is strongly influenced by the shape of the equilibrium. Simple estimates indicate that the cusp-like equilibrium should be more stable than the circular one.

40997 **Weibel instability in the spherical corona of a laser fusion target.** True, M.A. (KMS Fusion, Inc., P. O. Box 1567, Ann Arbor, Michigan 48106). *Physics of Fluids;* **28**: No. 8, 2597-2601(Aug 1985). Contract AC08-82DP40152.

The Weibel instability is caused by anisotropy in the velocity distribution. In the collisionless spherical corona of a laser fusion target, anisotropy in electron velocity space is naturally produced by a localized source because angular momentum, l = mv/sub perpendicular/r, is conserved and the perpendicular energy, E/sub perpendicular/ = l^2/2mr^2, decreases at radii large compared to the source radius. This occurs even if the source is locally isotropic (e.g., inverse bremsstrahlung around the critical density). Linear

growth rates are computed for the Weibel instability with a model distribution that includes the aforementioned effects as well as diffusion in angular momentum and energy loss by hydrodynamic expansion.

40998 **Stability of magnetically insulated electron flow.** Mendel C.W. Jr.; Swegle, J.A.; Seidel, D.B. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Physical Review [Section] A: General Physics;* **32**: No. 2, 1091-1097(Aug 1985).

The stability of magnetically insulated electron flow is studied for wavelengths longer than gyrolengths and frequencies lower than gyrofrequencies. This is done by using a general theory that allows for a distribution of electrons of different canonical momentum and total energy. The stability theory leads to a set of integro-differential equations for the eigenfunctions of the potentials. The integral portion of the equations relates positions across the flow that are connected by the finite size of the electron orbits. A general stability criterion is found. The stability of the flow is determined by the distribution of the electrons in canonical-momentum—total-energy space. The criterion can be stated roughly as depending upon whether the distribution function increases or decreases with drift velocity. If it increases, the flow is unstable.

40999 **Electron-acoustic mode.** Gary, S.P.; Tokar, R.L. (Earth and Space Sciences Division, University of California, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physics of Fluids;* **28**: No. 8, 2439-2441(Aug 1985). Contract AC02-82ER53136.

This paper examines electrostatic modes in an unmagnetized, homogeneous, Vlasov plasma with three Maxwellian components: ions, hot electrons, and cool electrons. In such a plasma, the electron-acoustic mode with frequencies between the ion and electron plasma frequencies may propagate with light damping. The conditions that allow propagation of this mode, which is distinct from the well-known ion-acoustic and Langmuir waves, are given in detail; approximate necessary conditions are 10< or ≈T/sub h// T/sub c/ and 0<n/sub c/<0.8n/sub e/, where the subscripts c, h, and e refer to the cool and hot electron components and the total electron population, respectively.

41000 **Spectral properties of the kinetic Alfven wave in cylindrical tokamak geometry.** van Rij, W.I.; Vahala, G.; Sigmar, D.J. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831). *Physics of Fluids;* **28**: No. 8, 2484-2493(Aug 1985). Contract AC05-84OR21400.

It is shown, for a tokamak-like cylindrical plasma and small poloidal and toroidal mode numbers, that the full gyrokinetic shear Alfven spectrum is discrete when k/sub parallel/not =0. Calculations of the global eigenmodes of the magnetohydrodynamic (MHD) limit, and their first-order finite Larmor radius (FLR) corrections, are presented. First-order FLR theory is found to be a good approximation to full FLR theory, even for modes with high radial node number. In the presence of a positive density gradient, such as that which may occur with pellet fueling of the plasma, the existence of global MHD eigenmodes above the Alfven continuum is confirmed.

41001 **Evidence in the second-harmonic emission for self-focusing of a laser pulse in a plasma.** Stamper, J.A.; Lehmberg, R.H.; Schmitt, A.; Herbst, M.J.; Young, F.C.; Gardner, J.H.; Obenschain, S.P. (U. S. Naval Research Laboratory, Washington, DC 20375-5000). *Physics of Fluids;* **28**: No. 8, 2563-2569(Aug 1985).

Short-pulse (300 psec), high-intensity (10^{14}-10^{15} W/cm^2) Nd-laser light was propagated into variable scale length plasmas (L/sub n/equivalentn/deln = 200—400 μm at 0.1 critical density)= preformed by long-pulse (4 nsec), low-intensity (≈6 x 10^{12} W/cm^2) irradiation of planar targets. For high short-pulse intensities (> or =5 x 10^{14} W/cm^2), time-integrated images show filament-shaped regions of second-harmonic ($2\omega_0$) emission from the low density (0.01< or =n/sub e//n/sub c/< or =0.2) region of the ablation plasma. Two-dimensional computer calculations of the hyrodynamics and laser beam propagation indicate that these filaments are consistent with ponderomotive self-focusing of the short pulse. A theoretical model that explains the $2\omega_0$ generation mechanism within low-density filaments is also presented.

41002 **Experimental results and theoretical analysis of the effect of wavelength on absorption and hot-electron generation in laser-plasma interaction.** Garban-Labaune, C.; Fabre, E.; Max, C.; Amiranoff, F.; Fabbro, R.; Virmont, J.; Mead, W.C. (Equipe de Greco Interaction Laser Matiere, Laboratoire de Physique Des Milieux Ionises, Groupe de Recherche du Centre National de la Recherche Scientifique, Ecole Polytechnique, F-91128 Palaiseau Cedex, France). *Physics of Fluids;* **28**: No. 8, 2580-2590(Aug 1985). Contract W-7405-ENG-48.

Recent experiments performed at Ecole Polytechnique on the wavelength scaling of laser light absorption by flat plastic targets are presented and interpreted. The measurements show larger absorption fractions for shorter laser wavelengths, lower laser intensities, and longer laser pulse lengths. These experiments are analyzed using computer hydrodynamics codes, and show that there are two possible physics models consistent with the data: (1) Inhibited electron heat flow together with absorption rates higher than those predicted by resonance absorption and inverse bremsstrahlung. (2) Nearly classical heat flow, with no additional enhancement in the absorption rate.

41003 **Spectrum and propagation of lower-hybrid waves in a tokamak plasma.** Watterson, R.L.; Takase, Y.; Bonoli, P.T.; Porkolab, M.; Slusher, R.E.; Surko, C.M. (Plasma Fusion Center, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Physics of Fluids;* **28**: No. 8, 2622-2624(Aug 1985). Contract AC02-78ET51013.

Waveguide-launched lower-hybrid waves are studied using CO_2 laser scattering techniques. These experiments provide the first direct experimental confirmation that the spectrum of the wavelengths inside, but near the edge of, the tokamak plasma is similar to predictions of linear theory for the launched spectrum and varies with waveguide phasing. The spectrum observed farther into the plasma is dominated by longer wavelengths and is much less dependent on phasing. An explanation of these results is presented.

41004 **Local power conservation for linear wave propagation in an inhomogeneous plasma.** McVey, B.D.; Sund, R.S.; Scharer, J.E. (Plasma Fusion Center, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Physical Review Letters;* **55**: No. 5, 507-510(29 Jul 1985). Contract AC02-78ET51013.

An expression for local power absorption for linear wave propagation in a nonuniform hot magnetoplasma is derived from fundamental principles. The power-absorption definition is used to obtain a local power-conservation relation for a one-dimensional configuration. The formalism is applied to wave propagation in the ion cyclotron range of frequencies where strong damping and mode-conversion processes are present.

41005 **Electron temperature and density measurements by harmonic electron cyclotron emissions from doublet-III tokamak plasma.** Yamamoto, T.; Abe, M.; Hirayama, T.; Kameari, A.; Kitsunezaki, A.; Kodama, K.; Konoshima, S.; Nagami, M.; Sengoku, S.; Shimada, M. (Japan Atomic Energy Research Institute, Tokai, Naka, Ibaraki, Japan). *Physical Review Letters;* **55**: No. 1, 83-86(1 Jul 1985). Contract AT03-80SF11512.

The intensity ratio of the second- to the third-harmonic cyclotron emission, measured by a scanning Fourier-transform spectrometer, is investigated for a wide range of discharge parameters. Dependences of the ratio on electron temperature and density are described by the model of plane-parallel walls. The time evolution of central electron density deduced from the ratio is consistent with multichannel CO_2 interferometer data within the estimated experimental error.

41006 **Implicit algorithm for compressible three-dimensional magnetohydrodynamic calculations.** Aydemir, A.Y.; Barnes, D.C. (Institute for Fusion Studies, University of Texas, Austin, Texas 78712). *Journal of Computational Physics;* **59**: No. 1, 108-119(30 May 1985). Contract FG05-80ET53088.

An efficient algorithm for the solution of compressible magnetohydrodynamic equations in a three-dimensional geometry is presented. Compressional Alfven waves are treated implicitly, thus greatly increasing the stable time step of the calculation and making it possible to study magnetohydrodynamic (MHD) phenomenon on resistive time scales.

41007 **Cyclotron resonance in a noneutral plasma.** Prasad, S.A.; Morales, G.J.; Fried, B.D. (Physics Department, University of California at Los Angeles, Los Angeles, California 90024). *Physical Review Letters;* **54**: No. 21, 2336-2338(27 May 1985).

Single-component plasmas are found to exhibit a reversal in the roles of cyclotron and upper hybrid resonances familiar in neutral plasmas. There is a global resonance at the cyclotron frequency $\omega = \Omega$equivalentqB/mc and a local field cancellation at layers where $\omega = \Omega_1 = (\Omega^2$-ω/sub p/$^2)$/sup 1/2/ ω/sub p/ being the local plasma frequency. Thermal effects limit the amplitude of the global resonance and produce energy absorption at the $\omega = \Omega_1$ layers.

41008 **Princeton spectral equilibrium code: PSEC.** Ling, K.M.; Jardin, S.C. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). *Journal of Computational Physics;* **58**: No. 3, 300-335(15 May 1985). Contract AC02-76CH03073.

A fast computer code has been developed to calculate free-boundary solutions to the plasma equilibrium equation that are consistent with the currents in external coils and conductors. The free-boundary formulation is based on the minimization of a mean-square error epsilon-c while the fixed-boundary solution is based on a variational principle and spectral representation of the coordinates x(psi, θ) and z(psi, θ). Specific calculations using the Columbia University Torus II, the Poloidal Divertor Experiment (PDX), and the Tokamak Fusion Test Reactor (TFTR) geometries are performed.

41009 **High-n ideal and resistive shear Alfven waves in tokamaks.** Cheng, C.Z.; Chen, L.; Chance, M.S. (Plasma Physics Laboratory, Princeton University, P.O. Box 451, Princeton, New Jersey 08544). *Annals of Physics (New York);* **161**: No. 1, 21-47(15 Apr 1985). Contract AC02-76CH03073.

Ideal and resistive MHD equations for the shear Alfven waves are studied in a low-β toroidal model by employing the high-n ballooning formalism. The ion sound effects are neglected. For an infinite shear slab, the ideal MHD model gives rise to a continuous spectrum of real frequencies and discrete eigenmodes (Alfven-Landau modes) with complex frequencies. With toroidal coupling effects due to nonuniform toroidal magnetic field, the continuum is broken up into small continuum bands and new discrete toroidal eigenmodes can exist inside the continuum gaps. Unstable ballooning eigenmodes are also introduced by the bad curvature when $\beta >$ β/sub c/. The resistivity (eta) can be considered perturbatively for the ideal modes. In addition, four branches of resistive modes are induced by the resistivity: (1) resistive entropy modes which are stable with frequencies going to zero with resistivity as eta/sup 1/3/; (2) tearing modes which are stable ($\Delta' < 0$) with frequencies approaching zero as eta/sup 3/5/; (3) resistive periodic shear Alfven waves which approach the finite frequency end points of the continuum bands as eta/sup 1/2/; and (4) resistive ballooning modes which are purely growing with growth rate proportional to eta/sup 1/3/β/sup 2/3/ as eta→0 and β→0.

41010 **Muon-catalysed fusion as a finite Markov process.** Van Siclen, C.DeW. (Idaho National Engineering Lab., Idaho Falls (USA)). *Journal of Physics G: Nuclear Physics;* **11**: No. 2, 267-276(Feb 1985).

By regarding muon catalysis of nuclear fusion in a mixture of hydrogen isotopes as a series of stochastic processes, markov chain theory is used to derive several exact analytic equations relating the rates of the various reactions and the sticking coefficients for the fusion channels. These include expressions for the mean number of pd, dd, dt, tt and pt fusions per muon, the mean total number of fusions per muon and the muon cycling rate, which reduce to the corresponding well known expressions for catalysis in a deuterium-tritium mixture. Inclusion of the fusion reaction dd$\mu \rightarrow$ pμ + t provides a particularly interesting complication, as this process gives rise to a catalysis cycle that may not return a free muon to the system.

41011 **Theoretical study of ICRF effects on multiple-mirror confinement.** Doniger, K.J.; Lieberman, M.A.; Lichtenberg, A.J. (California Univ., Berkeley (USA). Dept. of Electrical Engineering and Computer Sciences). *Nuclear Fusion;* **25**: No. 1, 3-20(Jan 1985).

The improvements in multi-mirror confinement due to an asymmetrically applied ion cyclotron resonance field (ICRF) are determined. The resonance field is used to selectively reflect ions that travel away from the centre of the device, thus creating a net ion drift towards the centre. The ICRF effects in heating and scattering the ions and modifying the loss cone geometry are determined in detail. A one-dimensional, non-ignited (finite Q = fusion power/recirculating power) model of a multiple-mirror system is used to investigate confinement. Various scaling laws are numerically derived and compared to those of a symmetric system without ICRF. Radial diffusion due to classical collisions and ICRF effects is calculated. A 21-cell machine with a peak field of 280 kG and Q=5 is reduced from 845 m to 580 m in length with the addition of the asymmetric ICRF. The total fusion power generated by the system is reduced from 8 to 6.3 GW.

41012 **Regime of improved energy confinement in beam-heated expanded-boundary discharges in Doublet III.** Ohyabu, N.; Burrell, K.H.; DeBoo, J. (GA Technologies, Inc., San Diego, CA (USA)). *Nuclear Fusion;* **25**: No. 1, 49-64(Jan 1985).

Neutral-beam-heated expanded-boundary (XB) divertor discharges have been obtained in Doublet III with high heating efficiency for wide ranges of plasma parameters (Isub(p): 300-800 kA; Bsub(T): 8-24 kG; n-barsub(e): (2-10)x10^{13}cm^{-3}; Psub(b)<4.5 MW, βsub(p)<=1.6, βsub(t)<=2.8%). The improved heating efficiency is well correlated with a configuration change from limiter discharges to XB discharges. The beam-heated, fully diverted expanded-boundary discharges with a limiter/separatrix distance greater than 1.5 cm exhibit an improvement of up to a factor of two in energy confinement time. The tausub(E) increases approximately linearly with Isub(p), but is insensitive to variations of a factor of two in n-barsub(e) and Bsub(T). Over the inner two-thirds of the plasma radius (r/a<=0.7), the shape of the Tsub(e) profile for XB discharges is similar to that for limiter discharges. Hence, the improvement of the global energy confinement is consistent with a reduction of thermal conductivity over most of the plasma radius. With 2 MW of neutral-beam injection into a high-current (Isub(p)=750 kA) XB discharge, energy confinement times tausub(E) approx.= 115 ms and n-barsub(e)tausub(E) approx.= 1x10^{13}cm^{-3}.s^{-1} have been obtained. At high beam power (Psub(b)>3 MW), a mild deterioration of the energy confinement time has been observed.

41013 **Global energy confinement scaling for neutral-beam-heated tokamaks.** Kaye, S.M.; Goldston, R.J. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Nuclear Fusion;* **25**: No. 1, 65-69(Jan 1985).

A total of 677 representative discharges from seven neutral-beam-heated tokamaks have been used to study the parametric scaling of global energy confinement time. Contributions to this data base were from Asdex, DITE, D-III, ISX-B, PDX, PLT and TFR, and were taken from results of gettered, L-mode type discharges. Assuming a power law dependence of tausub(E) on the discharge parameters kappa, Isub(p), Bsub(t), n-barsub(e)Psub(tot), a and R, standard multiple linear regression techniques were used in two steps to determine the scaling. The results indicate that the discharges used in the study are well described by the scaling tausub(E) is proportional to kappasup(0.28)Bsub(T)sup(-0.09)Isub(p)sup(1.24)n-barsub(e)sup(0.26) Psub(tot)sup(-0.58)asup(-0.49)Rsup(1.65).

41014 **Current drive in a high beta tokamak using magnetic pumping.** Chen, J.; Marshall, T.C. (Columbia Univ., New York (USA). Plasma Physics Lab.). *Plasma Physics and Controlled Fusion;* **27**: No. 1, 55-67(Jan 1985).

The R.F. current drive by magnetic pumping of a single wave in collisionless plasma is calculated by using an adiabatic invariant method on the Vlasov equation. The self-consistent field effect on this current is also calculated by the adiabatic method, and the relation between the efficiency and the external pumping wave amplitude is obtained. Calculations are made, appropriate to an experimental test in a small high beta Tokamak.

41015 **Using perpendicular electron cyclotron emission to diagnose the thermal-barrier electrons in a tandem mirror.** Celata, C.M. (Dartmouth Coll., Hanover, NH (USA)). *Nuclear Fusion;* **25**: No. 1, 35-48(Jan 1985).

Possibilities are explored for diagnosing the hot-electron distribution function of the thermal barriers of tandem mirrors, using perpendicular electron cyclotron emission. Emission from a relativistic bi-Maxwellian with a loss cone is calculated in the single-particle limit. Formulae are derived for finding T perpendicular by measurng frequencies of the harmonic intensity maxima at optically thin frequencies, or the intensity at optically thick frequencies. A positive deltaf/deltap perpendicular in the distribution function is shown to lead to decreased absorption and instability for low T perpendicular. Finally, the perpendicular source function is calculated in the single-particle limit for this distribution function.

41016 **Magnetic well depth in EBT and sensitivity to hot-electron ring geometry.** Jaeger, E.F.; Berry, L.A.; Hendrick, C.L.; Richards, R.K. (Oak Ridge National Lab., TN (USA)). *Nuclear Fusion;* **25**: No. 1, 71-84(Jan 1985).

The paper examines the possibility that diamagnetic currents in the hot-electron rings in the ELMO Bumpy Torus (EBT) plasma are strong enough to reverse gradients in phi dl/B, thereby providing gross magnetohydrodynamic stability. Using a two-dimensional solution to the Grad-Shafranov equation with tensor pressure, the electromotive force induced in a diamagnetic loop surrounding the EBT plasma is computed. This allows a direct comparison between the calculated and measured diamagnetic loop signals for different values of perpendicular energy stored in the electron rings.

41017 **Bounce-averaged Monte-Carlo calculations of ripple transport in stellarators.** Hitchon, W.N.G.; Beidler, C.D.; Shohet, J.L. (Wisconsin Univ., Madison (USA). Torsatron/Stellarator Lab.); Mynick, H.E. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Nuclear Fusion;* **25**: No. 1, 105-107(Jan 1985).

Letter-to-the-editor.

A rapid simulation of transport by trapped particles in stellarators, based on conservation of J, has been developed. At very low collision frequency the diffusion rates are not entirely in agreement with analytic theory. The potential importance of effects not described by an 'averaged' theory is discussed.

41018 **Stellarator hybrids.** Furth, H.P.; Ludescher, C. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). *Soviet Journal of Plasma Physics (English Translation);* **11**: No. 1, 2-6(Jan 1985).

Tokamak-stellarator and pinch-stellarator hybrids are reviewed. The t lational transform technique is proposed as a means of improving MHD stabi lity. (AIP)

41019 **Global conditions and electron energy transport*.** Coppi, B. (Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Soviet Journal of Plasma Physics (English Translation);* **11**: No. 1, 49-53(Jan 1985).

A class of transport coefficients that has been adopted in order to describe the observed electron energy confinement properties of high-temperature plasmas with different forms of thermal energy input is discussed.

41020 **Can the electrostatic ion-cyclotron instability be driven by a two-dimensional sheath.** Schittwieser, R.; Rynn, N.; Koslover, R.; Karim, R. (California Univ., Irvine (USA). Dept. of Physics). *Plasma Physics and Controlled Fusion;* **26**: No. 12, 1591-1595(Dec 1984).

An experiment in a single-ended Q-machine was conducted in which a voltage was applied between two concentric floating electrodes which terminated the plasma column. When the inner electrode was more than 200 V positive with respect to the outer one the electrostatic ion-cyclotron instability was observed. In the usual case the electron current is drawn between the grounded (plasma generating) hot plate and a positively biased electrode, with only a small voltage needed to trigger the instability. However, the current threshold is the same for both cases, indicating that it is a critical electron drift speed, not a sheath effect, which is necessary for the instability.

41021 **Electrostatic ion-cyclotron instability driven by a slow electron drift.** Schrittwieser, R.; Rynn, N.; Koslover, R.; Karim, R. (California Univ., Irvine (USA). Dept. of Physics). *Plasma Physics and Controlled Fusion;* **26**: No. 12, 1597-1604(Dec 1984).

The electrostatic ion-cyclotron instability can be excited in a single-ended Q-machine by a positively biased collector. An experiment is carried out to prove that drifting electrons are able to excite the ion-cyclotron instability. An electron drift is produced without the formation of a localized two-dimensional sheath. To that end the plasma electrons are delivered by a source which is spatially separated from the ion source. If the central section of these electrons is slightly accelerated by a grid the instability is observed.

41022 **Narrow band, near UV, high repetition rate laser induced fluorescence system for use as an edge diagnostic in fusion machines.** Young, C.E.; Calaway, W.F.; Gruen, D.M.; Pellin, M.J. (Materials Science and Technology Division Argonne National Laboratory, Argonne, IL). *Fusion Technology;* **6**: No. 2, 434-446(Sep 1984). (CONF-8309103—).

From 9. international vacuum congress and 5. international conference on solid surfaces; Madrid, Spain (26 Sep 1983).

A laser system for impurity diagnostics in the edge region of plasma devices is described. It consists of a scanning, single mode, cw dye laser followed by a 3-stage, fast flow dye cell amplifier, pumped by a high repetition rate excimer laser (60 mJ/pulse at 130 Hz, for 308 nm output). Substantial improvements are achieved over previous systems in scan speed (30 GHz/100 ms) and velocity resolution (now small relative to the widths of thermal distributions). The usefulness of high resolution is demonstrated by a model calculation for Fe velocity spectra involving the presence of thermal and sputtered flux, and spatial averaging. The high output pulse power (0.8 MW at 604 nm, 80 kW at 302 nm) allows efficient frequency doubling and can be used to vary the effective bandwidth by power broadening. Broadband operation (50 GHz FWHM) is also possible, for saturated measurements of atomic density. Laboratory velocity spectra for Fe atoms sputtered in the ground state demonstrate the capability for such measurements in a single Tokamak discharge at estimated densities of 10^8 atoms/cm^3.

41023 **Particle simulation of plasmas.** Douson, D.M.; Lin, A.T. (California Univ., Los Angeles (USA). Dept. of Physics). pp 83-146 of Plasma physics basis. Galeev, A.A.; Sudan, R. (eds.). Moscow, USSR; Ehnergoatomizdat (1984). (In Russian)

Translation from English.

Application of the method for numerical simulation of plasma turbulences is considered. Models of particles applicable for plasma simulation, some methods for diagnostics of the results of these calculations are discussed, and examples of the studied processes are presented. The results of investigation into transport in plasma transverse to the magnetic field generated by thermal electrostatical and magnetostatical fluctuations are described. Parametrical instabilities occurring from electromagnetic wave scattering on ion waves (Brilluen), on electron waves (Raman) or on particles (Compton) are considered, conversion of modes in inhomogeneous magnetized plasma is presented, generation of intense radiation from relativistic electron beams and inverse processes, i. e. acceleration of charged particles by an intense laser pulse are described.

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REFER ALSO TO CITATION(S) 39494, 39578, 39800, 40790, 40887, 40974, 40990

41024 **(CAPE—2943) Novette pulse-power-system description (Engineering Materials).** (Lawrence Livermore National Lab., CA (USA)). Dec 1981. Contract W-7405-ENG-48. H. File Number TI85000822.

Novette is a large, two-beam, two-wavelength laser facility at Lawrence Livermore National Laboratory. The Novette laser projected performance exceeds that of the 20-arm Shiva laser and the frequency-multiplying capability provides more-efficient target interaction. Novette is comprised of two arms of the Nova laser. New designs allow these two arms to exceed the performance of the 20 arms of Shiva. Assembling these two arms on an accelerated schedule allow the experimental program to continue with minimum interruption. The laser has been operational since January 1983. This paper is a summary of the pulse power systems for Novette; the flashlamp power system, the pulsers for the various optical shutters and the pulse power control system.

41025 **(CONF-850148—1) FEDC trade studies: upgraded capability exists to examine cost/performance sensitivities for all tokamak options.** Flanagan, C.A. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 30p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85006919.

From Ignition studies mission 2 meeting; Los Angeles, CA, USA (31 Jan 1985).

Included is the package of viewgraphs presented at the meeting. (MOW)

41026 **(CONF-850708—1) Tokamak startup: problems and scenarios related to the transient phases of ignited tokamak operations.** Sheffield, J. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 37p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015321.

From Workshop on tokamak start-up - problems and scenarios related to the transient phases of long-burn operations; Erice, Italy (14 Jul 1985).

During recent years improvements have been made to tokamak startup procedures, which are important to the optimization of ignited tokamaks. The use of rf-assisted startup and noninductive current drive has led to substantial reduction and even complete elimination of the volt-seconds used during startup, relaxing constraints on poloidal coil, vacuum vessel, and structure design. This paper reviews these and other improvements and discusses the various bulk heating techniques that may be used to ignite a D-T plasma.

41027 **(CONF-8505175—1) TPSS plasma engineering studies: profile effects and plasma power balance.** Borowski, S.K.; Strickler, D.J. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 12p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85013638.

From TPSS meeting; Atlanta, GA, USA (15 May 1985).

Handwritten manuscript.

A computationally fast profile-averaged, steady-state plasma model has been developed to allow studies of radial effects in ignited and driven tokamak systems. This code was used to search for the smallest size tokamak consistent with power balance calculations. (MOW)

41028 **(DOE/DP/40124—65) Hydrodynamics of long-scale-length plasmas. Summary.** Craxton, R.S. (Rochester Univ., NY (USA). Lab. for Laser Energetics). 1984. Contract AC08-80DP40124. 43p. (CONF-841010—17). NTIS, PC A03/MF A01; GPO Dep. File Number DE85014410.

From Meeting of the Plasma Physics Division of the American Physical Society; Boston, MA, USA (27 Oct 1984).

A summary is given relating to the importance of long-scale-length plasmas to laser fusion. Some experiments are listed in which long-scale-length plasmas have been produced and studied. This talk presents SAGE simulations of most of these experiments with the emphasis being placed on understanding the hydrodynamic conditions rather than the parametric/plasma-physics processes themselves which are not modeled by SAGE. However, interpretation of the experiments can often depend on a good understanding of the hydrodynamics, including optical ray tracing.

41029 **(DOE/ET/53051—83) Multipole and tokamak research at the University of Wisconsin.** Sprott, J.C.; Prager, S.C. (Wisconsin Univ., Madison (USA)). May 1985. Contract AC02-76ET53051. 12p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014862.

Experimental axisymmetric toroidal confinement research has been pursued at the University of Wisconsin through the utilization of multipole and tokamak devices. Multipoles facilitated the controlled study of key confinement issues since in a single device one is able to vary, over a wide range, critical plasma parameters including ohmic current level, collisionality, field transform, magnetic shear and plasma beta. This feature, and the natural quiescence of multipole plasmas, has been exploited for over twenty years at Wisconsin through a sequence of different multipole devices culminating in the Levitated Toroidal Octupole. Important aspects of toroidal plasma equilibrium, stability, heating and transport have been studied which often could not be addressed in existing tokamaks. Toroidal confinement research using the Tokapole II poloidal divertor tokamak began in 1977, with emphasis on issues relating to the magnetic limiter topology.

41030 **(EUR-CEA-FC—1232) Elements of a method to scale ignition reactor Tokamak.** Cotsaftis, M. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Recherches sur la Fusion Controlee). Aug 1984. 48p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85751933.

Due to unavoidable uncertainties from present scaling laws when projected to thermonuclear regime, a method is proposed to minimize these uncertainties in order to figure out the main parameters of ignited tokamak. The method mainly consists in searching, if any, a domain in adapted parameters space which allows Ignition, but is the least sensitive to possible change in scaling laws. In other words, Ignition domain is researched which is the intersection of all possible Ignition domains corresponding to all possible scaling laws produced by all possible transports.

41031 **(EUR-CEA-FC—1244) High power operation at 80 keV of the prototype PINI-B neutral injector of JET.** Becherer, R.; Bottiglioni, F.; Desmons, M.; Fumelli, M.; Raimbault, P.; Valckx, F.P.G. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Recherches sur la Fusion Controlee). Oct 1984. 26p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85751934.

In the framework of a cooperative program with JET and Culham Laboratory for neutral injection development for JET, FAR was charged to develop a 160 keV, 30 A, 5s deuterium beam required for the "extended performances" phase of JET. In addition to this main task, FAR Laboratory was also asked to test the PINI-B, one of the two prototypes of the 80 keV, 60 A, 5s hydrogen beam injectors intended for the "basic performances" phase of JET (the other prototype, the PINI-A, was tested at Culham). Tests of this unit were performed between June 82 and March 83. The main results of this work will be presented here.

41032 **(F—82003) Tritium monitoring requirements of fusion and the status of research.** Nickerson, S.B.; Gerdingh, R.F.; Penfold, K. (Canadian Fusion Fuels Technology Project, Toronto, Ontario). Oct 1982. 84p. NTIS (US Sales Only), PC A05/MF A01. File Number DE85701659.

This report is a summary of an investigation into the tritium monitoring requirements of tritium laboratories, D-T burning ignition experiments, and fusion reactors. There is also a summary of the status of research into tritium monitoring and a survey of commercially available tritium monitors.

41033 **(F—82004) Recommended program of tritium monitoring research and development.** Nickerson, S.B.; Gerdingh, R.F.; Penfold, K. (Canadian Fusion Fuels Technology Project, Toronto, Ontario). Oct 1982. 20p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85701660.

This report presents recommendations for programs of research and development in tritium monitoring instrumentation. These recommendations, if implemented, will offer Canadian industry the opportunity to develop marketable instruments. The major recommendations are to assist in the development and promotion of two Chalk River Nuclear Laboratories' monitors and an Ontario Hydro monitor, and to support research and development of a surface monitor.

41034 **(GA-A—17940) Tritium control in helium-cooled blankets.** Wong, C.P.C.; Maya, I.; Kessel, C.; Roelant, D.; Schultz, K.R. (GA Technologies, Inc., San Diego, CA (USA); California Univ., Los Angeles (USA); Michigan Univ., Ann Arbor (USA). Dept. of Nuclear Engineering). Jun 1985. Contract AC03-84ER53158. 12p. (CONF-850405—16). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014783.

From 2. national topical meeting on tritium technology in fission, fusion and isotopic applications; Dayton, OH, USA (30 Apr 1985).

As a part of the Blanket Comparison and Selection Study (BCSS), GA Technologies was responsible for the design of helium-cooled, solid- and liquid-metal breeder blankets. Conceptual blanket designs were developed, including the consideration of the generation, transport, and extraction of tritium. Evaluations were made of the inventory and leakage of tritium for helium-cooled Li_2O and $LiAlO_2$ and liquid lithium breeder blankets for tokamak and tandem mirror reactors. To facilitate the evaluation, a solid breeder tritium code TRIT4 was developed. The results from this study indicate that tritium inventories and leakages are acceptable for the proposed helium-cooled blankets. An assumption made in the tritium leakage calculations was that tritium is released to the helium purge and coolant streams as T_2 and remains in that form. If oxidation to T_2O is possible, significant reduction in the tritium leakage will be possible. We conclude that more experimental data on breeder material properties and tritium permeation behavior are needed. However, we are certain that an adequate number of different techniques are available to control the breeder tritium inventory and leakage to an acceptable level in helium-cooled solid- and lithium-breeder blankets.

41035 (INIS-BR—260, pp 132-140) **Approximated neutronic calculation for the tritium breeding ratio in fusion reactor blankets.** Santos, R. dos (Centro de Informacoes Nucleares, Rio de Janeiro (Brazil)). 1983. (In Portuguese). NTIS (US Sales Only), PC A20/MF A01. File Number DE85781434. (CONF-8311246—).

From 4. Brazilian meeting on reactor physics; Itaipava, RJ, Brazil (3 Nov 1983).

An approximated model for the calculation of the tritium breeding ratio in conceptual thermonuclear fusion reactor blankets is presented. This model makes use of the exponential absorption concept due to the $Li^6(n, He^4)T$ and $Li^7(n, n'He^4)T$ reactions. The results of this approximated method are compared with reference benchmarks which were generated by the nuclear codes ANISN (discrete ordinates) and MORSE (Monte Carlo method). The maximum deviation among the results have been around 10%.

41036 (INIS-SU—289, pp 99-101) **Study on possibility of development of a laser multicharged ion source for a heavy ion fusion driver.** Barabash, L.Z.; Krechet, K.I.; Lapitskij, Yu.Ya.; Latyshev, S.V.; Shumshurov, A.V.; Bykovskij, Yu.A.; Golubev, A.A.; Kozyrev, Yu.P.; Sharkov, B.Yu. (Inst. Teoreticheskoj i Ehksperimental'noj Fiziki, Moscow, USSR). 1983. (In Russian). NTIS (US Sales Only), PC A17/MF A01. File Number DE85781267. (CONF-8210133—Vol.1).

From 8. All-Union conference on the charged particle accelerators; Protvino, USSR (19 Oct 1982).

The results of studying laser produced plasma ion sources for a heavy ion accelerating-storage complex used as a heavy ion fusion driver are presented. The following parameters were measured on an installation aimed for studying physical characteristics of heavy ion laser plasma for a lead target at laser radiation flux density of approximately 3×10^{10} W/cm^2: scattered ion charge composition, energy spectra and scattering angle distributions, ion currents, absolute number of ions in every charge state, plasma electron temperature. The ion current pulse duration varied from 3×10^{-4} s at Z^{+1} to 2×10^{-5} s at Z^{+10}. The maximum current amplitude of 2 mA corresponded to Z^{+7} charge. The scattering velocity increased with charge. The total number of ions that could be used for acceleration was approximately 5×10^{13} for Z^{+2} and 5×10^{12} for Z^{+6} per pulse. The ion laser source brightness was 2×10^{11} A/cm^2, the particle phase density was 10^{18} (cmxrad)$^{-1}$. 4 references, 4 figures.

41037 **(JAERI-M—83-235) Report of the 2nd workshop on particle material interactions for fusion research.** Ozawa, Kunio; Gesi, Kazuo; Iwata, Tadao (eds.). (Japan Atomic Energy Research Inst., Tokyo). Feb 1984. 178p. (In Japanese). NTIS (US Sales Only), PC A09/MF A01. File Number DE85701753.

The plenary session of the sub-committee for the data-banking of particle-material interactions in the Research Committee of A M Data Center was held at the JAERI Headquarters, Tokyo, February 24 and 25, 1982. The subsequent local meeting was held in Osaka branch office of JAERI, June 10, 1982. The aim of this workshop has been not only to make clear the present status in the A M data banking and the material science relevant to fusion research, but also to obtain an overview of the approaches that should be developed for solving the problems. In these workshops, 16 papers on the specified fields were presented by the committee members. This report contains these papers, and the investigation report in 1982 fiscal year on Diffusional Behaviour of Hydrogen and it's Isotope in Iron and Steel is added supplementarily. The contents of this report are composed of 4 chapters which are connected with each other concerning A M activities of hydrogen recycling: 1) Perspective review, 2) Re-emission and Retention, 3) Desorption and Diffusion, and 4) Radiation effects of neutron and ions on hydrogen recycling process.

41038 **(JAERI-M—84-087) In-pile test of tritium recovery from lithium oxide. Tritium release behavior.** Kurasawa, Toshimasa; Yoshida, Hiroshi; Watanabe, Hitoshi; Takeshita, Hidefumi; Miyauchi, Takejiro; Matsui, Tomoaki. (Japan Atomic Energy Research Inst., Tokyo). May 1984. 62p. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. File Number DE85701615.

In-situ tritium recovery experiment with sintered lithium oxide pellets was performed under a high neutron fluence in the JRR-2. The irradiation hole VT-10 is the vertical one in the fuel rods region of the reactor, and the neutron flux is as follows: the thermal neutron flux with the epithermal neutron; 1.12×10^{14} n/cm^2. sec, the fast neutron flux; 1.0×10^{13} n/cm^2. sec. Irradiation material is the four pellets of cylindrical Li_2O with the size of 11mm-OD, 1.8mm-ID, 10mm-H, and their total weight is 6.67g(the apparent bulk density 86%TD). A sweep gas capsule with a inner heater was constructed for the present study. Irradiation temperatures were regulated in the high temperature range, 470 -- 760°C. Four cycles of irradiation tests were carried out from May to August in 1983, and the effective thermal neutron fluence and the burnup of ^{6}Li were 5.9×10^{19}nvt and 0.24% of total lithium(natural abundance of Li), respectively. The amount of generated tritium was calculated to be 31.2Ci by using a value of the depression factor of the thermal neutron flux(0.148) and the effective neutron cross section(543b) for the ^{6}Li(n, α) ^{3}H reaction. Present report describes the tritium release behavior in the in-situ tritium recovery apparatus and discuss the effects of the moisture, the hydrogen spiking, the irradiation temperature, etc.. Problems relative to a real time measurement of a comparatively high tritium concentration(10^{-1} -- 10^2 μCi/cm^3) in the helium gas stream were also investigated.

41039 **(PPPL—2190) Reaching ignition in the tokamak.** Furth, H.P. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jun 1985. Contract AC02-76CH03073. 31p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015100.

This review covers the following areas: (1) the physics of burning plasmas, (2) plasma physics requirements for reaching ignition, (3) design studies for ignition devices, and (4) prospects for an ignition project. (MOW)

41040 **(PPPL—2228) Vacuum vessel eddy current modeling for TFTR adiabatic compression experiments.** DeLucia, J.; Bell, M.; Wong, K.L. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1985. Contract AC02-76CH03073. 44p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015314.

A relatively simple current filament model of the TFTR vacuum vessel is described. It is used to estimate the three-dimensional structure of magnetic field perturbations in the vicinity of the plasma that arise from vacuum vessel eddy currents induced during adiabatic compression. Eddy currents are calculated self-consistently with the plasma motion. The Shafranov formula and adiabatic scaling laws are used to model the plasma. Although the specific application is to TFTR, the present model is of generation applicability.

41041 **(PPPL—2231) Relaxation of spheromak plasmas toward a minimum-energy state through global magnetic fluctuations.** Janos, A.; Hart, G.W.; Yamada, M. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1985. Contract AC02-76CH03073. 17p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015202.

Globally coherent modes which are observed during formation in the S-1 Spheromak plasma are shown to be important for flux conversion and plasma relaxation toward a minimum-energy state. A significant finding is the temporal progression through the n = 5, 4, 3, 2; m = 1 mode sequence as q rises through rational fractions m/n, where n and m are defined by the functional dependence e/sup i(nphi + mθ/) of the fluctuations on toroidal angle phi and poloidal angle θ. Resistive MHD analysis predicts the observed modes and the sequence of occurrence.

41042 **(PPPL—2233) Experimental research on toroidal devices at PPPL: 1960-1985.** (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jun 1985. Contract AC02-76CH03073. 81p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE85015311.

Separate abstracts were prepared for each of the 7 included papers. (MOW)

41043 (PPPL—2233, pp 1-8) **Experiments on the Model C Stellarator.** Yoshikawa, S.; Stix, T.H. Jun 1985. NTIS, PC A05/MF A01. File Number DE85015311.

In Experimental research on toroidal devices at PPPL: 1960-1985.

The Model C Stellarator was the last and most powerful of a series of stellarator devices operated at Princeton during the period from 1953 to 1969. Experiments on Model C addressed the problem of anomalous plasma loss and tested major innovative concepts including the divertor and radio-frequency (rf) heating. This review focuses on portions of Model C work that have strongly influenced present-day research and understanding of toroidal confinement in stellarators and tokamaks.

41044 **(SAND—85-1235C) Velocity measurements of laser driven flyers backed by high impedance windows.** Sheffield, S.A.; Rogers, J.W. Jr.; Castaneda, J.N. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 13p. (CONF-850736—30). NTIS, PC A02/MF A01; GPO Dep. File Number DE85015142.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

Because of possible applications to inertial confinement fusion, the response of free-standing foils to laser intensity levels of 10^3 to 10^6 GW/cm² has been well characterized. Our interest is in characterizing the response of free-standing and backed foils at much lower intensities, i.e., in the region of 1 to 20 GW/cm², and using these flyers to initiate insensitive secondary high explosives. The output of a 3.5-J Nd:glass laser with a 16 ns pulse was used to drive 1.5-mm-diameter aluminum (Al) flyers. The velocities of both free-standing flyers and flyers backed on the driven side by windows of water, fused silica, or sapphire were measured using ORVIS (Optically Recording Velocity Interferometer System). Intensities were on the order of 10 GW/cm² and velocities as high as 5 km/s were measured for 13-μm/thick, Al flyers. Velocity and acceleration were observed to vary only slightly with the shock impedance of the window. Preliminary measurements indicate that PETN (pentaerythritol tetranitrate) at a density of 1.4 grams/cm³, and HNS-FP (hexanitrostilbene-fine particle) at a density of 1.6 grams/cm³, can be promptly detonated by 66-μm-thick, Al flyers impacting at a velocity of near 2.5 km/s.

41045 **Effect of wall material on H^- production in a multicusp source.** Leung, K.N.; Ehlers, K.W.; Pyle, R.V. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Applied Physics Letters;* **47**: No. 3, 227-228(1 Aug 1985). Contract AC03-76SF00098.

The effect of wall material on volume H^- production in a magnetically filtered multicusp source has been investigated. Under the same discharge conditions, Al and Cu generally produce the highest H^- ion current. It is shown that secondary electrons emitted from wall surfaces can account for the difference in H^- yield.

41046 **Compact, inexpensive target design for steady-state heat removal in high-heat-flux fusion applications.** Combs, S.K.; Milora, S.L.; Foster, C.A.; Haselton, H.H.; Menon, M.M.; Tsai, C.C. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831). *Review of Scientific Instruments;* **56**: No. 8, 1526-1530(Aug 1985). Contract AC05-84OR21400.

A high-heat-flux target has been developed for intercepting multimegawatt, multisecond neutral beams at Oak Ridge National Laboratory (ORNL). Water-cooled copper swirl tubes are used for the heat transfer medium; these tubes exhibit an enhancement in burnout heat flux over conventional axial flow tubes. The target consists of 126 swirl tubes [each 0.95 cm in outside diameter (o.d.) with 0.16-cm-thick walls and roughly-equal1 m long] arranged in a V shape and inclined with respect to the beam axis. In tests with the ORNL long-pulse ion source (13 x 43-cm grid), the target has handled up to 3-MW, 30-s beam pulses with no deleterious effects. The peak power density was estimated at roughly-equal15 kW/cm² normal to the beam axis (>5 kW/cm² maximum on tube surfaces). The water flow rate through the tubes was 0.33 l/s (5.2 gal/min) per tube (axial flow velocity = 11.6 m/s) with a corresponding pressure drop of 1.14 MPa (165 psi). To date, the target has absorbed an estimated 25 000 full-power (roughly-equal3 MW) pulses for a cumulative time of roughly-equal100 000 beam seconds without failure. Other potential applications for swirl tube technology in the fusion area include plasma limiters, divertor collector plates, rf launchers, and Faraday shields.

41047 **The United States program for magnetic fusion energy.** Dowling, R.J.; Berk, S.E.; Clarke, J.F. (Office of Fusion Energy, Office of Energy Research, U.S. Department of Energy, Washington, DC). *Fusion Technology;* **6**: No. 2, 327-334(Sep 1984). (CONF-8309103—).

From 9. international vacuum congress and 5. international conference on solid surfaces; Madrid, Spain (26 Sep 1983).

The United States (U.S.) Government supports a national program that seeks to demonstrate the scientific and engineering feasibility of magnetic fusion. The goal of the U.S. program is to develop a reactor concept to the point where decisions on commercial development can be made. This goal focuses the U.S. program on moving from its present research and development status toward commercial development. The U.S. program is nearing completion of the scientific feasibility phase, which will demonstrate that a magnetically confined plasma can produce, on a laboratory scale, a significant amount of energy in a potentially useful form. The U.S. plan is to pursue, at a pace commensurate with available resources, the product definition phase, which will identify a potentially practical confinement concept, and the product development phase, which will develop the technical base necessary for decisions about

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the practical use of magnetic fusion. This paper provides an overview of the U.S. magnetic fusion energy program including goals and objectives, strategy, status, international cooperation, and budgets.

41048 **Application of railgun principle to high-velocity hydrogen pellet injection for magnetic fusion reactor refueling.** Kim, K.; Honig, J. (Department of Electrical Engineering, University of Illinois, Urbana, Illinois). *Fusion Technology;* 6: No. 2, 372-377(Sep 1984). (CONF-8309103—).

From 9. international vacuum congress and 5. international conference on solid surfaces; Madrid, Spain (26 Sep 1983).

Design, construction, testing, and performance evaluation of a small-bore plasma-arc-driven electromagnetic railgun system are described. The railgun system, which is intended for injecting high-velocity hydrogen pellets into the magnetic fusion devices for the purpose of refueling, has two acceleration stages. One consists of a gas gun preaccelerator and the other a railgun booster accelerator. The plasma-arc armature is formed behind the pellet by electrically discharging the propellant gas following the pellet into the railgun from the gas gun.

41049 **On the fabrication of a uniform thick fuel layer inside a cryogenic inertial confinement fusion target.** Kim, K. (Department of Electrical Engineering, University of Illinois, Urbana, Illinois). *Fusion Technology;* 6: No. 2, 357-363(Sep 1984). (CONF-8309103—).

From 9. international vacuum congress and 5. international conference on solid surfaces; Madrid, Spain (26 Sep 1983).

Key physics issues essential to the fabrication of a uniform fuel layer inside a cryogenic spherical-shell inertial confinement fusion (ICF) target are addressed. Existing methods for fabricating cryogenic ICF targets are briefly reviewed and their anticipated difficulties in producing a thick uniform fuel layer are pointed out. New methods designed to circumvent the drawbacks of the existing techniques are proposed. Experimental devices intended to implement the new methods are described.

41050 **Design and construction of the vacuum vessel for the tandem mirror fusion test facility.** Gerich, J.W. (University of California, Lawrence Livermore National Laboratory, Livermore, California). *Fusion Technology;* 6: No. 2, 351-356(Sep 1984). (CONF-8309103—).

From 9. international vacuum congress and 5. international conference on solid surfaces; Madrid, Spain (26 Sep 1983).

The authors have designed the MFTF-B vacuum vessel both to maintain the required vacuum environment and to structurally support the 42 superconducting magnets plus auxiliary internal and external equipment. The design calculations were greatly aided by computer models, which also speeded our redesign effort when the machine configuration was changed to the Axicell MFTF-B this past year.

41051 **Progress report on pump limiter developments for the TEXTOR tokamak: ALT-I.** Pontau, A.E.; Campbell, G.A.; Doyle, B.L.; Finken, F.H.; Gauster, W.B.; Guthrie, S.E.; Malinowski, M.E.; Ver Berkmoes, A.A.; Watson, R.D.; Whitley, J.B. (Sandia Nat. Laboratories, Livermore, CA). *Fusion Technology;* 6: No. 2, 384-392(Sep 1984). (CONF-8309103—).

From 9. international vacuum congress and 5. international conference on solid surfaces; Madrid, Spain (26 Sep 1983).

A collaborative program is underway to field a comprehensive pump limiter experimental program on TEXTOR: Advanced Limiter Test-I (ALT-I). Either of two interchangeable limiter modules may be attached to an insertion/rotation mechanism to direct particles to the about1 m^3 pumping chamber. Pumping is provided primarily by a solid getter assembly at about20,000 1/sec. Variation of geometric dimensions and gas puffing in the modules will allow the study of plasma and neutral interaction in differing recycle regimes. Multiple diagnostic systems are incorporated into the pump limiter design for use in conjunction with TEXTOR plasma diagnostics. Initial experiments are scheduled for December 1983.

41052 **Vacuum measurements on the Tandem Mirror Experiment Upgrade (TMX-U) fusion experiment.** Hunt, A.L.; Lang, D.D.; Nexsen, W.E.; Pickles, W.L.; Turner, W.C. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 6: No. 2, 364-371(Sep 1984). (CONF-8309103—).

From 9. international vacuum congress and 5. international conference on solid surfaces; Madrid, Spain (26 Sep 1983).

The gas inventory of the Tandem Mirror Experiment Upgrade (TMX-U) must be carefully controlled, if it is to successfully create various plasma configurations for thermal barrier experiments designed to provide an improved performance for tandem mirror experiments. This paper is a progress report on the calibration methods and pressure measurements of machine conditions deriving from recently improved neutral-beam gas control, and changes to the internal baffling geometry and the gettering system. Various recorded pressure vs time histories produced by the machine's internal vacuum systems and their pumping mechanisms are presented. An upgraded computer code for calculating dynamic pressures is described. Our concluding remarks deal with the problems of establishing and maintaining a pressure measuring system for a large fusion experiment, where the quality and reliability of components must be carefully considered.

41053 **Heavy ion fusion physics.** Bangerter, R.O. (Los Alamos National Lab., NM (USA)). *Laser and Particle Beams;* 2: 387-393(1984).

Some of the basic questions pertinent to the feasibility of heavy ion fusion are reconsidered with HIBALL I as the 'standard' HIF scenario. The questions are quantified by developing scaling laws that enable the cost and capacity of HIBALL-like power plants to be varied.

41054 **Design constraints for an RF-linac/storage-ring driver.** Wangler, T.P. (Los Alamos National Lab., NM (USA)). *Laser and Particle Beams;* 2: 413-424(1984).

Some equations are reviewed that must be satisfied when generating RF-linac/storage-ring systems for heavy ion fusion. To treat the phase-space constraints, new formulae are derived for separate transverse and longitudinal available dilution factors in terms of parameters of the RF-linac/storage-ring system. A method is outlined for generating accelerator designs that satisfy target, current amplification, phase-space, and space-charge constraints.

41055 **Integral experiments for fusion reactor shield design - summary of progress.** Santoro, R.T.; Alsmiller, R.G. Jr.; Barnes, J.M.; Chapman, G.T. (Oak Ridge National Lab., TN (USA)). pp 627-635 of Proceedings of the sixth international conference on radiation shielding, 2. Tokai, Japan; Japan Atomic Energy Research Inst. (1983). (CONF-830538—Pt.2).

From 6. international conference on radiation shielding; Tokyo, Japan (16 May 1983).

Neutron and gamma-ray energy spectra from the reactions of ~14-MeV neutrons in blanket and shield materials and from the streaming of these neutrons through a cylindrical duct (L/D ~2) have been measured and calculated. These data are being obtained in a series of integral experiments to verify the radiation transport methods and nuclear data that are being used in nuclear design calculations for fusion reactors. The experimental procedures and analytic methods used to obtain the calculated data are reviewed. Comparisons between measured and calculated data for the experiments that have been performed to date are summarized.

41056 **Proceedings of the sixth international conference on radiation shielding, 2.** Tokai, Japan; Japan Atomic Energy Research Institute (1983). 662p. (CONF-830538—Pt.2).

From 6. international conference on radiation shielding; Tokyo, Japan (16 May 1983).

Separate abstracts were prepared for each of the included papers. (MOW)

41057 **Laser fusion experiments at Lawrence Livermore Laboratory.** Ahlstrom, H.G. (Lawrence Livermore National Lab., CA (USA)). pp 1-287 of Laser-plasma interaction. Balian, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique); Adam, J.C. (Ecole Polytechnique, 91 - Palaiseau (France). Centre de Physique Theorique) (eds.). Amsterdam, Netherlands; North-Holland (1982). (CONF-8006278—).

From Summer school on laser-plasma interaction; Les Houches, France (30 Jun 1980).

In this paper, the author discusses diagnostic instrumentation and experiments relevant to the use of high intensity, high energy, short pulse lasers to produce microexplosions of inertial confined thermonuclear fuel. First, the diagnostic instrumentation is dealt with: methods and instruments associated with measuring the absorption of the laser energy, the plasma conditions and the implosion history and burn of the thermonuclear fuel. The section on experiments treats the interaction of the laser light with the plasma and the transport of the energy in the generation of the spherical compression waves. In addition the laser irradiation facilities at Lawrence Livermore Laboratory are briefly discussed.

99 GENERAL AND MISCELLANEOUS

41058 **(CONF-8411176—Summ.) Historically black colleges and universities invitational working session, November 8 and 9, 1984.** Dobbins, C.J. (comp.). (Space Qualified Systems Ltd., Washington, DC (USA)). 19 Feb 1985. Contract AC01-83MI10027. 25p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85014907.

From Historically black colleges and universities invitational working session; Washington, DC, USA (8 Nov 1984).

The Department of Energy (DoE) convened a 2-day Invitational Working Session (See Appendix A) November 8 and 9, 1984 at which 61 Historically Black College and University (HBCU) and 25 federal representatives discussed the "Interactive R and D Cluster Model" developed by the NAFEO Science and Technology Advisory Committee. Its purpose was to solicit candid responses to the Cluster Model from both the institutional and federal agency perspectives. As a result, the Department of Energy would be provided feedback on the issues of the practicality of the use of the Model as a vehicle to improve HBCU participation in energy-related activites.

41059 **(DOE/MA—0138/5) Listing of awardee names: retired awards as of July 1, 1985.** (USDOE Assistant Secretary for Management and Administration, Washington, DC. Office of Procurement Support). 1 Jul 1985. 679p. NTIS, PC A99/MF A01; 1; GPO Dep. File Number DE85014881.

The Listing of Awardee Names is a computerized listing issued quarterly from the Procurement and Assistance Data System (PADS), including an alphabetical listing of all acquisition and financial assistance awards (excluding purchase orders) with the Department of Energy. This volume provides awards that have been closed out and retired at the time of issuance of the listing.

41060 **(DOE/MI/10028—T2-App.) Management and technical assistance to minority business enterprise. Appendices. Final report.** (Resources, Inc., Washington, DC (USA)). 31 Jan 1985. Contract AC01-83MI10028. 184p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE85013107.

These appendices include work management plan, letters, implementation plan, software, analyses of potential technology procurements, etc. (DLC)

41061 **(GAO/NSIAD—85-61) Actions taken by DOD on GAO recommendations to improve spare parts requirements determination.** (General Accounting Office, Washington, DC (USA). National Security and International Affairs Div.). 30 Apr 1985. 32p. US General Accounting Office, Box 6015, Gaithersburg, MD 20877. File Number TI85901767.

Report to the Honorable Sam Nunn, United States Senate.

GAO found that actions taken by the military services and DOD to improve the spare parts requirements determination process, in response to prior GAO report recommendations, have resulted in estimated cost savings of over $800 million during the past 5 years. Additional actions in process should result in further estimated savings of over $500 million.

41062 **(GAO/NSIAD—85-62) Issues affecting appropriations for the African Development Foundation.** (General Accounting Office, Washington, DC (USA). National Security and International Affairs Div.). 7 May 1985. 35p. US General Accounting Office, Box 6015, Gaithersburg, MD 20877. File Number TI85901768.

Report to the Chairman, Subcommittee on Foreign Operations, Committee on Appropriations, United States Senate.

In 1980 the Congress authorized establishment of the African Development Foundation (ADF) to fill the gap between larger US assistance programs and the needs of Africa at the grass roots level. ADF's first year of operations began in fiscal year 1984, but program development efforts came to a virtual standstill in April and May 1984 when its first president and vice president resigned. In June 1984, the Chairman of the Subcommittee on Foreign Operations asked GAO to review the operations of ADF to determine if it has the necessary management capability to efficiently spend more federal dollars and to meet its mandate. GAO conducted its review during July-November 1984 and found that ADF was putting into place the staff and administrative capacity to manage a modest program. However, GAO questions ADF's envisioned program growth to as much as $100 million within the next 5 years. GAO believes ADF should demonstrate the viability of its management and program systems before plans for substantial growth are approved.

41063 **(GAO/NSIAD—85-72) Improved controls needed over waivers of the Armed Services Exchange Regulations.** (General Accounting Office, Washington, DC (USA). National Security and International Affairs Div.). 13 May 1985. 19p. US General Accounting Office, PO Box 6015, Gaithersburg, MD 20877. File Number TI85901771.

Report to the Honorable Steve Symms, United States Senate.

If a base exchange wants to sell items other than those authorized by the Armed Services Exchange Regulations, a waiver can be approved by the Secretary of the service concerned on the grounds that the base is geographically isolated. The Secretary of the Air Force approved a waiver so that the base exchange at Mountain Home Air Force Base could sell certain major home appliances. It is questionable whether the base should still be considered isolated and, therefore, whether there is a continued need for the waiver. Further, GAO found several areas where the internal controls over the granting and revalidation of waivers could be improved. This report makes several recommendations designed to improve these internal controls. DOD agreed with GAO recommendations and has instituted actions to implement them.

41064 **(GAO/NSIAD—85-77) Foreign industrial targeting: US trade law remedies.** Bowsher, C.A. (General Accounting Office, Washington, DC (USA). Office of the Comptroller General). 23 May 1985. 45p. US General Accounting Office, Box 6015, Gaithersburg, MD 20877. File Number TI85901764.

Report to The Congress.

Many US business leaders have been increasingly concerned that foreign industrial targeting, the coordinated government support of specific industries, puts US firms at an unfair disadvantage. However, most nations, including the United States, provide some support. Distinguishing between "fair" and "unfair" targeting practices requires examining the facts of each case. Determining whether US business has been hurt by foreign practices also must be resolved on a case-by-case basis. As mandated by the Trade and Tariff Act of 1984, this report examines issues surrounding foreign industrial targeting and the applicability of current US trade laws. GAO believes that current law provides the opportunity to adequately address foreign targeting practices.

41065 **(INIS-BR—279) Proceedings of the 4. Japan - Brazil Symposium on Science and Technology. Vol. 4.** (Academia de Ciencias do Estado de Sao Paulo (Brazil)). 1984. 221p. (CONF-8408159—Vol.4). NTIS (US Sales Only), PC A10/MF A01. File Number DE85781265.

From 4. Japan-Brazil symposium on science and technology; Rio de Janeiro;Sao Paulo, Brazil (6 Aug 1984).

Individual items in scope for the data base are processed separately.

41066 **Explosively separable casing.** Jacobson, A.K.; Kychnovsky, R.E.; Visbeck, C.N. (to Dept. of Energy). US Patent 4,499,829. 19 Feb 1985. Filed date 8 Mar 1983. vp. PAT-APPL-473177.

An explosively separable casing including a cylindrical afterbody and a circular cover for one end of the afterbody is disclosed. The afterbody has a cylindrical tongue extending longitudinally from one end which is matingly received in a corresponding groove in the cover. The groove is sized to provide a pocket between the end of the tongue and the remainder of the groove so that an explosive can be located therein. A seal is also provided between the tongue and the groove for sealing the pocket from the atmosphere. A frangible holding device is utilized to hold the cover to the afterbody. When the explosive is ignited, the increase in pressure in the pocket causes the cover to be accelerated away from the afterbody. Preferably, the inner wall of the afterbody is in the same plane as the inner wall of the tongue to provide a maximum space for storage in the afterbody and the side wall of the cover is thicker than the side wall of the afterbody so as to provide a sufficiently strong surrounding portion for the pocket in which the explosion takes place. The detonator for the explosive is also located on the cover and is carried away with the cover during separation. The seal is preferably located at the longitudinal end of the tongue and has a chevron cross section.

9901 Management

41067 **(CNEA-NT—10/82) Activities of the Development Branch. 1978-1981.** Candame de Gallo, R.; Marrapodi, M.R.E.; Baez, L.B. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Desarrollo). 1982. 183p. (In Spanish). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781322.

The activities carried out by the Development Branch from 1978 through 1981 are summarized. Subjects covered include: Metallurgy, Nuclear Fuels, Instrumentation and Control, Nuclear Reactors, as well as the various projects developed during this period and the administrative and technical activities of various groups belonging to this Branch. A list of publications by personnel of this Branch during the same period is also included.

41068 **(CNEA-NT—18/82) Summary of activities of the Research Branch during 1981.** (Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Investigaciones). Jul 1982. 76p. (In Spanish). NTIS (US Sales Only), PC A05/MF A01. File Number DE85781323.

A general view of the work performed during 1981 by CNEA's Research Branch in basic and applied research is provided. The information includes the main activities and achievements in: 1) Physics Department: Tandar Project; Technical Assistance and Engineering; Experimental and Theoretical Nuclear Physics; Solid State Physics. 2) Reactor Chemistry Department: Chemical Control Division; Moderator and Coolant Physical-Chemistry Division; Radiation Chemistry Division. 3) Radiobiology Department: Radiation Pathology; Cellular Biology; Somatic Effects of the Ionizing Radiations; Genetics; Radiomicrobiology; Bioterium; Irradiation and Dosimetry Section, and, finally, in Biomathematics, Labelled Molecules and Radiochemistry.

41069 **(DOE/EIA—0249(85/1)) Directory of Energy Data Collection Forms. Forms in use as of April 1985.** (USDOE Energy Information Administration, Washington, DC. Office of Statistical Standards). Jul 1985. 42p. NTIS, PC A03/MF A01 - GPO; GPO Dep. File Number DE85015553.

A listing of the energy information gathering forms approved for use by the Department of Energy on April 1, 1985, is provided. For each form, a descriptive abstract and the data collected are given. Also shown are the general energy sources(s) and function(s) covered by the form; the general categories of respondents; the frequency of collection; the public laws and regulations associated with the collection; the requirement for reporting; the name and phone numbers of the data collection manager; and the publications resulting from the data collection. Several indexes to the forms are also provided.

41070 **(DOE/S—0004/1) 1985 Guide to practice and procedure.** (USDOE Board of Contract Appeals, Washington, DC). Jan 1985. 190p. NTIS, PC A09/MF A01; GPO Dep. File Number DE85015535.

DOE contractual arrangements range from complex research and development contracts to loan guaranties and financial assistance agreements. Disputes and appeals which arise in the performance of these agreement when contractors and others disagree with decisions of government officials require resolution. It is for this purpose that the boards were established originally. While the boards have traditionally been concerned with such disputes, the additional authority and responsibilities granted to them under the CDA underline the crucial role they now occupy in the area of government procurement and related activities. From its inception, the DOE Board of Contract Appeals established a policy favoring rules that would emphasize the need for a prompt, impartial and inexpensive resolution of disputes. Equally important towards realizing this goal is the necessity that contractors, subcontractors and government counsel be aware as fully as possible of their rights and remedies under the contract and the Act, as well as of the rules and procedures issued by the Board to resolve disputes. These factors were the underlying reasons for publishing this Guide.

41071 **(INIS-mf—9487) Philippine Atomic Energy Commission: Annual report 1982.** (Philippine Atomic Energy Commission, Diliman, Quezon City). Feb 1983. 75p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85701686.

Illus. .

This publication enumerates the research and development activities of the Philippine Atomic Energy Commission with priorities geared towards achieving the economic and social upliftment of the Filipinos in the field of agriculture, energy, industry, health and environment. Highlights are summaries of investigations and studies of great importance in crop improvement, animal production, nuclear fuels, nutrition research, not to mention its supportive technology, technical services, nuclear information and public acceptance, and nuclear manpower development.

41072 **(INIS-mf—9488) Philippine Atomic Energy Commission: Annual report 1983.** (Philippine Atomic Energy Commission, Diliman, Quezon City). Jan 1984. 37p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701687.

Illus. .

This publication gives the highlights of the research and development projects of the Philippine Atomic Energy Commission in agriculture and food, nuclear fuels and power system technology, medicine, public health and nutrition, environmental surveillance, supportive basic research, social response to nuclear technology, nuclear licensing and safeguards, supportive technology and international and local linkages including manpower development.

41073 **(INIS-mf—9681) Annual report 1983. [Institute for Energy Technology, Norway].** (Institute for Energy Technology, Kjeller (Norway)). 1983. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781514.

Nuclear power, isotope technology and basic research in physics comprises the nuclear activities of Institute for Energy Technology (IFE), Norway. These activities represented in 1983 about 60% of the gross turnover and use about 50% of the state grant. IFE's nuclear power work is now mainly connected with the Halden reactor, where international collaboration through the OECD Halden Reactor Project enables Norway to carry out ad-

vanced research in central areas of nuclear power technology. The present programme in Halden is concentrated on fuel and safety research, as well as computerbased methods for control and surveillance of reactor installations. An important part of the reactor safety work at IFE is concentrated on Nordic collaboration projects under the direction of the Nordic Coordination Committee for Atomic Energy (NKA). The isotope laboratories activity includes the provision of isotopes, irradiation technology assignements and the development of new products and application methods in the field. Activities within basic research in physics are largely based on the use of neutron beams from the JEEP II reactor for research into the structure and dynamics of solid and liquid materials. The research activity has a broad contact network with Norwegian and foreign research groups. During 1983 IFE continued its countrywide monitoring of radioactive fallout which it began in 1982 as an assignment for the Norwegian Defence Research Establishment. The Committee of IFE's Founders report on IFE's place within Norwegian research was handled by the authorities and interested parties during 1983. This report is seen as an important foundation for IFE's further development and effort. (RF).

41074 **(INS-R—321) Nuclear Physics Group progress report January-December 1982.** Coote, G.E. (ed.). (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). Aug 1983. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85701688.

The work of the Nuclear Physics Group of the Institute of Nuclear Sciences during the period July-December 1981 is described. Installation of the EN-tandem electrostatic accelerator proceeded to the voltage test stage. Highlights of the research programme included nuclear microprobe studies of bone and teeth, and depth profiling of sodium in hydrated obsidian.

41075 **(NUREG/CR—3481-Vol.2) Nuclear power plant personnel qualifications and training: TAPS: the task analysis profiling system. Volume 2.** Jorgensen, C.C. (Oak Ridge National Lab., TN (USA)). Jun 1985. Contract AC05-84OR21400. 235p. (ORNL/TM—9308/V2). NTIS, PC A11/MF A01 - GPO. File Number TI85014906.

This report discusses an automated task analysis profiling system (TAPS) designed to provide a linking tool between the behaviors of nuclear power plant operators in performing their tasks and the measurement tools necessary to evaluate their in-plant performance. TAPS assists in the identification of the entry-level skill, knowledge, ability and attitude (SKAA) requirements for the various tasks and rapidly associates them with measurement tests and human factors principles. This report describes the development of TAPS and presents its first demonstration. It begins with characteristics of skilled human performance and proceeds to postulate a cognitive model to formally describe these characteristics. A method is derived for linking SKAA characteristics to measurement tests. The entire process is then automated in the form of a task analysis computer program. The development of the program is detailed and a user guide with annotated code listings and supporting test information is provided.

41076 **(UCRL—92077-II) Inner/outer iterative methods and numerical Schwarz algorithms - II.** Rodrigue, G.; Saylor, P. (Lawrence Livermore National Lab., CA (USA); Illinois Univ., Chicago (USA)). May 1985. Contract W-7405-ENG-48. 41p. (CONF-8505157—1). NTIS, PC A03/MF A01; GPO Dep. File Number DE85013197.

From IBM conference on vector and parallel computations for scientific computing; Rome, Italy (28 May 1985).

Variants of the numerical Schwarz algorithms for solving elliptic partial differential equations on multiprocessing systems are described and analyzed. The methods are described in terms of domain decomposition techniques and mathematically cast into an inter/outer matrix iteration form. It is shown that under certain matrix nonnegativity conditions that the convergence rate of the global iteration is invariant to the amount of overlap of the subdomains when one inner iteration is taken.

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 39147, 40020, 40487, 40879

41077 **(ANL/MCS-TM—23) Performance of various computers using standard linear equations software in a Fortran environment.** Dongarra, J.J. (Argonne National Lab., IL (USA)). 15 Jul 1985. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015338.

This note compares the performance of different computer systems while solving dense systems of linear equations using the LINPACK software in a Fortran environment. About 100 computers, ranging from a CRAY X-MP to the 68,000 based systems such as the Apollo and SUN Workstations to IBM PC's, are compared.

41078 **(CONF-8503154—1) Hypercube concurrent computation and virtual time for robotic application.** Barhen, J. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 31p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85009479.

From International conference on robotics research; St. Louis, MI, USA (25 Mar 1985).

The programmatic activities of CESAR, the Center for Engineering Systems Advanced Research, are briefly reviewed. In the concurrent computation area, critical issues related to the control of intelligent machines using hypercube ensembles are outlined. The mapping of task graphs exhibiting structural irregularity and nonlocal communication patterns is discussed and the results of an application to the solution of robot inverse dynamics are given. Finally, the design of a Virtual Time Intelligent Machine Operating System (IMOS/VT) for the ORNL/NCube ensemble computer is presented.

41079 **(CTA-IEAV-NT—027/83) Grassmann algebras.** Garcia, R.L. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Estudos Avancados). Nov 1983. 21p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE85701690.

The Grassmann algebra is presented briefly. Exponential and logarithm of matrices functions, whose elements belong to this algebra, are studied with the help of the SCHOONSCHIP and REDUCE 2 algebraic manipulators.

41080 **(DOE/ER/10954—3) Iterative solution and finite element analysis in computational mechanics using supercomputers. Progress report, July 1, 1981-July 31, 1984.** Carey, G.F.; Young, D.M. (Texas Univ., Austin (USA)). 1984. Contract AS05-81ER10954. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85014732.

This study deals with the use of iterative solution algorithms in conjunction with finite element methods for solving partial differential equations arising in mechanics. Some aspects of the work are directed to the question of suitability of classes of techniques for computations on advanced vector and parallel architectures.

41081 **(EGG-M—01285) Potential uses of probabilistic risk assessment techniques for space station development.** Bruske, S.Z.; Wright, R.E.; Geaslen, W.D. (EG and G Idaho, Inc., Idaho Falls (USA); EG and G Space Systems, Titusville, FL (USA)). 1985. Contract AC07-76ID01570. 9p. (CONF-8503153—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014629.

From Aerospace computer security conference; McLean, VA, USA (20 Mar 1985).

This paper presents the state of the art in probabilistic risk assessment (PRA) techniques used in the nuclear power industry, and discusses how these techniques can be applied to concerns associated with the development of a space station. PRA is valuable for evaluating safety concerns and unwanted events from system conception to final design. Identification of such concerns early in system development is essential to their elimination of mitigation. Once a system design has been chosen, PRA can also yield justification for system changes, for optimizing safety and reliability, and for demonstrating compliance with design and safety goals. The

paper presents basic PRA theory and offers an outline of PRA methodology. It also discusses operator action event trees (OAETs), an advance in PRA techniques, used to examine operator responses to off-normal events. OAETs can also be used to develop staffing and communication requirements and other managerial information. The paper also discusses advantages of applying PRA techniques to the field of space station design, operation, and maintenance. 3 refs., 10 figs.

41082 **(EGG-M—07685) Transistorized multigrid methods. I. Linear elliptic problems on two- and three-dimensional regions.** Shieh, A. (EG and G Idaho, Inc., Idaho Falls (USA)). Mar 1985. Contract AC07-76ID01570. 46p. (CONF-8504100—2). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85014632.

From 2. Copper Mountain conference on multigrid methods; Copper Mountain, CO, USA (1 Apr 1985).

Suitable combination of mathematical transistors and half-weighting filters gives accurate estimate of local truncation error for moderate size problems with reasonable smooth solutions without up and down cycling. The use of symmetric mathematical transistors is particularly effective for supercomputing.

41083 **(EPRI-NP—2709-CCM-Vol.4) ABAQUS-EPGEN: a general-purpose finite-element code. Volume 4. Systems manual.** Hibbitt, H.D.; Karlsson, B.I.; Sorensen, E.P. (Hibbitt and Karlsson, Inc., Providence, RI (USA)). Jun 1985. 392p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI85920724.

This document is the Systems Manual for ABAQUS/EPGEN, a general purpose finite element computer program designed specifically to serve advanced structural analysis needs. ABAQUS/EPGEN is a large, modular, software system, made up of libraries of finite elements, constitutive models, arithmetic routines, and executive level routines that control the flow through the program to provide various analysis procedures. ABAQUS has extensive data files which are managed independently from the engineering/modeling code. The program is written in FORTRAN 77, with additional conventions within the language to ensure that the code is readily portable across different computers and operating systems. This includes support of fully single and fully double precision versions. This manual documents the system design of the code, including detailed descriptions of data file contents, and dictionaries of subroutines and common blocks. This outline can help programmers and development engineers understand the structure of the code and its use on different computers and operating systems. The highly sophisticated, nonlinear computer code supports advanced structural analyses for nuclear and fossil fuel power plant designs. The ABAQUS-EPGEN code analyzes such general nonlinear phenomena as fluid-structure interactions, reinforced concrete behavior, thermal stress, fracture mechanics, and high-temperature structural behavior. 18 refs.

41084 (INIS-mf—9482, pp 22) **Data acquisition and preliminary processing with 8085 microprocessor in absolute activity measurement.** Dutka, Z.; Zidek, V. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague (Czechoslovakia)). Aug 1983. (In Czech). NTIS (US Sales Only), PC A08/MF A01. File Number DE85780916. (CONF-8311230—Absts.).

From 6. national symposium on radiation dosimetry; Marianske Lazne, Czechoslovakia (28 Nov 1983).

Published in summary form only.

41085 **(INIS-mf—9567) FGM - a flexible gamma-spectrum analysis program for a small computer.** Szekely, G. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). Jun 1984. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781512.

A general purpose gamma-spectrum analysis program was developed on the basis of old programs written for big computers. The new program was adapted to mini- and microcomputers which can be used near the spot of the measurement. Computing methods to compensate the shorter word length, less memory and slower speed are built in the program and some recent mathematical methods for background and peak determination are applied, too. Detailed description of data processing method, parameter determination, error estimation, program organization, system variables, file organization, input and output formats and hardware requirements are presented. Some test run outputs are coupled.

41086 (INIS-mf—9625, pp 20) **Supplements to Jupiter system software.** Hulka, J.; Kuca, P.; Malatova, I.; Rulik, P. (Institut Hygieny a Epidemiologie, Prague (Czechoslovakia)). Oct 1984. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE85780928. (CONF-8410254—Absts.).

From IAA '84 - seminar on instrumental activation analysis; Klucenice, Czechoslovakia (29 Oct 1984).

Published in summary form only.

41087 **(LA-UR—85-2035) Attempt to develop an "intelligent" lens design program.** Viswanathan, V.K.; Bohachevsky, I.O.; Cotter, T.P. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 13p. (CONF-8506142—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE85014122.

From International lens design conference; Cherry Hill, NJ, USA (10 Jun 1985).

We are developing a Lens Design Program intended to operate without user intervention, and to improve its performace with repeated usage. The methodology and current status will be discussed in this paper. 5 refs., 6 figs.

41088 **(LA-UR—85-2292) Early history of computer simulations in statistical mechanics.** Wood, W.W. (Los Alamos National Lab., NM (USA); Carroll Coll., Helena, MT (USA)). 24 Jun 1985. Contract W-7405-ENG-36. 32p. (CONF-850764—1). NTIS, PC A03/MF A01; GPO Dep. File Number DE85014067.

From International School of Physics on molecular dynamics simulation of statistical mechanical systems; Varenna, Lake Como, Italy (23 Jul 1985).

A history of the early use of the Monte Carlo method is presented.

41089 **(OEFZS-A—0506) Description of the data acquisition software for cement-asbestos machines.** Bochskanl, W.; Stoisser, Ch. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Mar 1984. 185p. (In German). (MI—63/84). Author, OEFZS, A-2444 Seibersdorf, Austria.

Limited Distribution.

A computer program for PDP8 computer is described which handles the data acquisition for cement-asbestos machines. From these data an extensive report is generated containing production management data.

41090 **(SAND—85-1046C) Fiber optic ring network.** Gossage, S.A. (Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 6p. (CONF-850887—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85013948.

From SPIE international technical symposium on optical and electro-optical engineers; San Diego, CA, USA (18 Aug 1985).

An optical fiber cable distribution architecture and a ring interface are described. The unique synergism of the ring configuration coupled with a widespread optical fiber cable facility are explored. The ring interface adapts a token passing network of workstations from coaxial cable to 50 micron core, telecommunications type, fiber optic cable. The optical fiber cable links a series of communications centers to as many as 288 optical fibers. The loop distribution of optical fibers forms the backbone for a 6.7 km ring operating at 6 to 12 Mbps.

41091 **(SOL—85-10) Existence of equilibrium prices for a simple planning model.** Hu, H. (Stanford Univ., CA (USA). Systems Optimization Lab.). Jun 1985. Contract AS03-76ER72018. 13p. NTIS, PC A02/MF A01; GPO Dep. File Number DE85015095.

A linear programming planning model is given with an economic interpretation of the model. (GHT)

41092 **(SOL—85-11) Projected Newton barrier methods for linear programming and an equivalence to Karmarkar's projective method.** Gill, P.E.; Murray, W.; Saunders, M.A.; Tomlin, J.A.; Wright, M.H. (Stanford Univ., CA (USA). Systems Optimization Lab.). Jul 1985. Contract AS03-76ER72018. 29p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE85015096.

We discuss interior-point methods for linear programming derived by applying a logarithmic barrier transformation and performing projected Newton steps for a sequence of barrier parameters. Under cetain conditions, one of these "projected Newton barrier" methods is shown to be equivalent to Karmarkar's (1984) projective method for linear programming. Details are given of a specific barrier algorithm and its practical implementation. Numerical results are given for several nontrivial test problems.

41093 **(Y—2351) Computer-assisted program design.** Young, K.G. (Oak Ridge Y-12 Plant, TN (USA)). 28 Jun 1985. Contract AC05-84OS21400. 27p. NTIS, PC A03/MF A01; GPO Dep. File Number DE85015315.

An automated interactive specification technique that has a mathematical basis is discussed. Two sample applications, a hypothetical environmental monitoring system and data management in an industrial environment, are presented. To give a realistic understanding of this new technique, alternative methods of software specification are discussed. This new technique appears to be particularly suited for large complex systems. 10 refs., 12 figs.

9903 Information Handling

REFER ALSO TO CITATION(S) 39220, 39236, 39237

41094 **(AD-A—153364/5/XAB) Distributed memory. Technical report.** Cooper, L.N. (Brown Univ., Providence, RI (USA). Center for Neural Science). 13 Mar 1985. 12p. NTIS, PC A02/MF A01.

A brief account is given of how a neural network can store a distributed content addressable memory. Some of the properties of such a network as well as a possible site of storage of long and short-term memory are discussed.

41095 **(GAO/RCED—85-15) Outlook for expanding the Federal Research In Progress System.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). 22 Oct 1984. 23p. US General Accounting Office, Box 6015, Gaithersburg, MD 20877. File Number TI85901773.

This document is the result of a request by the Joint Economic Committee to conduct a study of the federal government's research and development efforts in the fields of new materials, electronic devices, and biotechnology. The review was focused on the NTIS Federal Research In Progress System, and on how the Japanese and European governments manage such information. (DLC)

41096 (INDC(CCP)—222/L, pp 31-41) **Integrated hardware/software configuration for the evaluation of nuclear data.** Zvenigorodskij, A.G.; Agureev, V.A.; Dunaev, I.B.; Dunaeva, S.A.; Lomtev, G.A.; Matvej, V.N.; Shapovalov, A.F. Nov 1984. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781274.

Russian original distributed as INDC(CCP)-207/G.

In Translation of selected papers published in Nuclear Constants, Volume 2(51), Moscow 1983.

The article reviews a hardware/software configuration designed along modular lines for tasks involving graphically presented information, especially suitable for organizing collections of nuclear data.

41097 (INIS-mf—9573-Vol.1, pp 1-23) **Nuclear information and documentation center.** Zamora, P. (Instituto Nacional de Investigaciones Nucleares, Mexico City). 1981. (In Spanish). NTIS (US Sales Only), PC A09/MF A01. File Number DE85781445.

From International training course on the use of radiation and isotopic techniques in soil-plant relationships; Irapuato (Mexico) (3 Nov - 11 Dec 1981).

Described are the activities and services of the Nuclear Information and Documentation Center of the Mexican National Institute of Nuclear Research, among which the most important are: DSI computerized services, compilation of bibliographies and current awareness.

41098 **(PNL—5527) Assurance Program for Remedial Action (APRA) microcomputer-operated bibliography management system.** Stenner, R.D.; Washburn, D.K.; Denham, D.H. (Pacific Northwest Labs., Richland, WA (USA)). Jun 1985. Contract AC06-76RL01830. 68p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE85008763.

Pacific Northwest Laboratory (PNL) provided technical assistance to the Office of Operational Safety (OOS) in developing their Assurance Program for Remedial Action (APRA). The APRA Bibliography Management System (BMS), a microcomputer-operated system designed to file, locate and retrieve project-specific bibliographic data, was developed to manage the documentation associated with APRA. The BMS uses APRABASE, a PNL-developed computer program written in dBASE II language, which is designed to operate using the commercially available dBASE II database software. This document describes the APRABASE computer program, its associated subprograms, and the dBASE II APRA file. A User's Manual is also provided in the document. Although the BMS was designed to manage APRA-associated documents, it could be easily adapted for use in handling bibliographic data associated with any project.

41099 **(SAND—85-0308C) Sandia shock compression database.** Anderson, C.E.; Wilbeck, J.S.; Hokanson, J.C.; Asay, J.R.; Grady, D.E.; Graham, R.A.; Kipp, M.E. (Southwest Research Inst., San Antonio, TX (USA); Sandia National Labs., Albuquerque, NM (USA)). 1985. Contract AC04-76DP00789. 11p. (CONF-850736—29). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE85015141.

From American Physical Society topical conference on shock waves in condensed matter; Spokane, WA, USA (22 Jul 1985).

An authoritative, updatable, and searchable bibliographic database whose topical area is shock compression is currently under development. The database is derived from published scientific articles and reports with current emphasis in the subareas of strength, phase transitions, spall, and stress-volume relations. The content of the cited work is described by keywords which are selected and reviewed by scientific advisors. Keywords are organized to provide major and minor descriptors which summarize the technical content in considerable detail. Details of theoretical and experimental approaches are described and major emphasis is identified. In addition to bibliographic information, abstracts are also included, and a field is provided for figure captions and table headings.

9904 Law

41100 **(INIS-mf—9689) Sim and Ritchie's summary of the law relating to atomic energy and radioactive substances.** Grazebrook, D.; Turner, M. (UKAEA Headquarters, London). Dec 1984. 24p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781492.

The law is summarised under the headings: the Common Law; the Legislation; Regulations under the Factories Act 1961; Regulations relating to educational establishments; Regulations and Orders relating to food and medicines; Regulations, Rules, etc. affecting the transport of radioactive materials; Regulations under the Social Security Act 1975; control of import and export; the Euratom Treaty; important non-statutory Codes of Practice, etc.; international Conventions, Regulations, etc. relating to the peaceful use of atomic energy and radioactive substances, in which the United Kingdom is interested; foreign legislation. (U.K.).

41101 **(INIS-mf—9725) Atomic Energy Amendment Act (No. 2) 1980 No. 119 of 1980.** (International Atomic Energy Agency, Vienna (Austria)). 11 Sep 1980. 3p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85781509.

This Act amends those provisions of the Atomic Energy Act 1953 concerning the manner in which the Australian Atomic Energy Commission can deal in securities or borrow money. (NEA).

41102 **(INIS-mf—9726) Radioactive Substances and Irradiating Apparatus Regulations 1962-1979 (South Australia).** (International Atomic Energy Agency, Vienna (Austria)). 6 Jun 1980. 45p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85781493.

These regulations are a consolidation of regulations made under the Health Act 1935-1978, which cover such topics as licensing, registration and record-keeping procedures, prevention of injury by radiation and methods of storage, labelling, transport and packaging of radioactive substances. (NEA).

9905 Civilian Defense

41103 **(ORNL/TM—9411) Provision of shelter for critical workers: potential social issues and policy options.** Schweitzer, M.; Rickert, L.W. (Oak Ridge National Lab., TN (USA)). Jul 1985. Contract AC05-84OR21400. 54p. NTIS, PC A04/MF A01; GPO Dep. File Number DE85015055.

Two major types of social issues are discussed: (1) adoption issues, which focus on the process by which individuals choose to adopt an innovation such as the construction or use of critical worker shelter; and (2) infrastructure issues, which address those institutions and organizations that provide the goods and services needed to facilitiate adoption. A number of tentative policy options are suggested for addressing these potential social issues. These options are organized by four basic categories of action: (1) education and persuasion; (2) provision of goods and services; (3) use of tax incentives; and (4) regulation. Most of these policies can be established by the federal government to encourage public and private sector critical facilities (or critical workers themselves) to provide necessary shelter, but some could also be enacted by employers attempting to get critical workers to construct individual shelters at home. Should federal civil defense planners decide that the available evidence indicates that the practical difficulties associated with a critical worker shelter program can be overcome at an acceptable cost, then further research in this area is in order. Not only is more information necessary concerning the adoption and infrastructure issues identified here, but research is also needed on major societal issues to help determine if a critical-worker shelter program is in the best interest of society as a whole.

CORPORATE AUTHOR INDEX

In the Corporate Author Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the document title and the volume and abstract numbers. The document type, e.g., R for Report; country of publication, e.g., US; and language of the document, e.g., In German, are given in parentheses at the end of the entry. If no language statement appears, the language is English. Tables of document types and country of publication codes appear after the indexes.

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The notations in the final parentheses indicate the type of document, e.g., R for Report; the country of publication, e.g., US; and the language if other than English, e.g., In German. Tables of document types and country of publication codes appear after the indexes.

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processes applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept (e.g., Pipeline Quality Gas, see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed. Copies of DOE/TIC-7000, the Subject Thesaurus, are available from the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, VA 22161.

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	Clarke Ambrose, Inc., Knoxville, TN (USA)	
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AC05-84OT21400	**Oak Ridge Gaseous Diffusion Plant, TN (USA)**	
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AC06-76FF02170	**Hanford Engineering Development Lab., Richland, WA (USA)**	
	19:39220	HEDL-SA—3274-S
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AC06-76RL01830	**General Electric Co., Richland, WA (USA). Hanford Atomic Products Operation**	
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	Pacific Northwest Labs., Richland, WA (USA)	
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	United Nuclear Industries, Inc., Richland, WA (USA)	
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AC06-77RL01030	**Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations**	
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	Analytic and Computational Research, Inc., Los Angeles, CA (USA)	
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AC08-80DP40124	**Rochester Univ., NY (USA). Lab. for Laser Energetics**	
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AC08-82DP40152	**KMS Fusion, Inc., 3621 South State Road, P.O. Box 1567, Ann Arbor, Michigan 48106-1567**	
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AC09-76SR00001	**Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant**	
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AC21-83FE60338	**United Technologies Corp., South Windsor, CT (USA). Power Systems Div.**	
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AC21-84MC21153	**Oral Roberts Univ., Tulsa, OK (USA)**	
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AC22-80PC30264	Occidental Research Corp., Irvine, CA (USA)	
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AC22-81PC40268	Foster Wheeler Development Corp., Livingston, NJ (USA)	
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AC22-82PC50030	Rockwell International Corp., Canoga Park, CA (USA). Rocketdyne Div.	
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AC22-82PC50270	TRW Space and Technology Group, Redondo Beach, CA (USA)	
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AC22-83PC60775	Institute of Gas Technology, Chicago, IL (USA)	
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AC22-84PC70507	Avco-Everett Research Lab., Everett, MA (USA)	
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AC22-84PC70771	Energy and Environmental Research Corp., Irvine, CA (USA)	
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AC22-84PC71010	Saxena (S.C.), Skokie, IL (USA)	
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AI01-76ET20356	Jet Propulsion Lab., Pasadena, CA (USA)	
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AS05-76EV03728	Louisiana State Univ., Baton Rouge (USA). Dept. of Zoology and Physiology	
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AS05-83ER60179	Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)	
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FG01-84CE40561	**ACEC Research and Management Foundation, Washington, DC (USA)**	
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FG01-84IE10372	**ICF, Inc., Washington, DC (USA)**	
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FG01-85CE15216	**Jones (William A.) and Associates, Lotus, CA (USA)**	
	19:38788	DOE/CE/15216—T1
FG02-81ER10864	**American Inst. of Physics, New York**	
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FG02-84ER13237	**Department of Chemistry, Cornell University, Ithaca, New York 14853**	
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FG02-84ER40169	**Illinois Univ., Chicago (USA). Dept. of Physics**	
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FG02-84ER45082	**Department of Physics, University of Delaware, Newark, Delaware 19715**	
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FG02-84ER60257	**Harvard Univ., Cambridge, MA (USA). Biological Labs.**	
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FG05-80ET53088	**Texas Univ., Austin (USA). Inst. for Fusion Studies**	
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FG22-82PC50793	**Auburn Univ., AL (USA). Coal Conversion Lab.**	
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FG22-83PC60054	**Pittsburgh Univ., PA (USA)**	
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FG22-83PC60778	**SRI International, Menlo Park, CA (USA)**	
	19:38666	CONF-850942—12
FG22-83PC60787	**Oklahoma State Univ., Stillwater (USA). School of Chemical Engineering**	
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FG22-83PC60797	**Southern Illinois Univ., Carbondale (USA). Dept. of Mechanical Engineering and Energy Processes**	
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FG22-83PC60798	**Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemical Engineering**	
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FG22-83PC60803	**Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering**	
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FG22-83PC60804	**Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science**	
	19:39693	DOE/PC/60804—T7
FG22-83PC60805	**Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering**	
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FG22-83PC60806	**Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Mining and Minerals Engineering**	
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FG22-84PC70057	**Illinois Inst. of Tech., Chicago (USA). Dept. of Chemical Engineering**	
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FG22-84PC70061	**Massachusetts Inst. of Tech., Cambridge (USA)**	
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FG22-84PC70773	**Lehigh Univ., Bethlehem, PA (USA). Dept. of Chemistry**	
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FG22-84PC70795	**Lehigh Univ., Bethlehem, PA (USA). Dept. of Chemistry**	
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FG22-84PC70801	**Illinois Univ., Urbana (USA). Dept. of Chemical Engineering**	
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FG22-84PC70809	**University of Southern California, Los Angeles (USA)**	
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FG22-84PC70812	**Wyoming Univ., Laramie (USA). Dept. of Chemical Engineering**	
	19:38699	DOE/PC/70812—3
FG22-84PC72268	**Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Virginia Center for Coal and Energy Research**	
	19:38732	DOE/PC/72268—5
FG42-80R205121	**Flowers by Ford, Inc., Penns Grove, NJ (USA)**	
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FG42-81R205292	**Fraser (J.Kenneth) and Associates, Rensselaer, NY (USA)**	
	19:38982	DOE/R2/05292—T1
FG42-81R205322	**Silva (R.N.), Ridgewood, NJ (USA)**	
	19:39438	DOE/R2/05322—T1
FG47-80CS69097	**Iowa State Univ. of Science and Technology, Ames (USA). Energy Extension Service**	
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	19:38989	DOE/R8/05031—T1

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2943	USDOE-TIC, PO Bx 62, Oak Ridge, TN 37830	TI85000822	ND -21	19:41024
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035/ 83	NTIS (US Sales Only), PC A02/MF A01	DE85701710	MN -34A	19:40916
081/ 83	NTIS (US Sales Only), PC A02/MF A01	DE85781055	MN -34C	19:39645
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7524	NTIS (US Sales Only), PC A05; 3	DE85901856	MN -2	19:39400
8027	NTIS (US Sales Only), PC A03/MF A01	DE85901857	MN -11	19:40167
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7201	NTIS (US Sales Only), PC A03/MF A01; 1	DE85752293	MN -61	19:38997
7348	NTIS (US Sales Only), PC A02/MF A01	DE85752292	MN -61G	19:38998
7351	NTIS (US Sales Only), PC A02/MF A01	DE85751925	MN -25	19:39606
7383	NTIS (US Sales Only), PC A02/MF A01; 1	DE85752294	MN -11	19:40122
7410	NTIS (US Sales Only), PC A02/MF A01	DE85751991	MN -10	19:39889
7418	NTIS (US Sales Only), PC A03/MF A01	DE85751945	MN -10	19:38838
7436	NTIS (US Sales Only), PC A02/MF A01	DE85751924	MN -25	19:39482
7437	NTIS (US Sales Only), PC A02/MF A01	DE85751990	MN -80	19:39185
7471	NTIS (US Sales Only), PC A02/MF A01	DE85751987	MN -86	19:38839
7472	NTIS (US Sales Only), PC A02/MF A01	DE85751989	MN -83	19:38840
7500	NTIS (US Sales Only), PC A02/MF A01	DE85751944	MN -25	19:39483
7542	NTIS (US Sales Only), PC A02/MF A01	DE85751947	MN -48	19:40212
7543	NTIS (US Sales Only), PC A02/MF A01	DE85751992	MN -41	19:40213
7544	NTIS (US Sales Only), PC A02/MF A01	DE85751993	MN -48	19:40214
7545	NTIS (US Sales Only), PC A02/MF A01	DE85751994	MN -48	19:40215
CEA-IPSN-DPS-				
84-04	NTIS (US Sales Only), PC A06/MF A01	DE85751931	MN -41	19:40888
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2406	NTIS (US Sales Only), PC A09/MF A01	DE85751948	MN -34C	19:40645
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5239	NTIS (US Sales Only), PC A14/MF A01	DE85751941	MN -25	19:39484
5283	NTIS (US Sales Only), PC A09/MF A01	DE85751998	MN -25	19:39485
5291	NTIS (US Sales Only), PC A08/MF A01	DE85751940	MN -25	19:39486
5292	NTIS (US Sales Only), PC A05/MF A01	DE85751996	MN -25	19:39487
5293	NTIS (US Sales Only), PC A04/MF A01	DE85751997	MN -34C	19:39646
CEGB-TPRD/B-				
0441/ N84	NTIS (US Sales Only), PC A03/MF A01	DE85701875	MN -41	19:39247
0442/ N84	NTIS (US Sales Only), PC A02/MF A01	DE85701882	MN -71	19:39715
0459/ N84	NTIS (US Sales Only), PC A02/MF A01	DE85701877	MN -41	19:40262
0460/ N84	NTIS (US Sales Only), PC A02/MF A01	DE85701878	MN -41	19:40263
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10/ 82	NTIS (US Sales Only), PC A09/MF A01	DE85781322	MN -2	19:41067
15/ 82	NTIS (US Sales Only), PC A13/MF A01	DE85701906	MN -25	19:39647
16/ 82	NTIS (US Sales Only), PC A03/MF A01	DE85781321	MN -2	19:38973
18/ 82	NTIS (US Sales Only), PC A05/MF A01	DE85781323	MN -2	19:41068
19/ 82	NTIS (US Sales Only), PC A03/MF A01	DE85701907	MN -25	19:39488

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CONF-790842-	(International conference of global atmospheric pollution, Boulder, CO, USA, 12-18 Aug 1979)				
	J. Geophys. Res., 85: No. C10, 5621-5630(20 Oct 1980)				19:40154
	J. Geophys. Res., 85: No. C10, 5588-5598(20 Oct 1980)				19:40192
CONF-8010379-	(Joint symposium on stationary combustion NOx control, Denver, CO, USA, 6-9 Oct 1980)				
Vol.1	*See* PB-81-236119		TI85901488	MN -90i	19:38724
CONF-801103-	(IEEE nuclear science symposium, Orlando, FL, USA, 5-7 Nov 1980)				
46	*See* HEDL-SA-2262	E 1.99:	TI85015347	MN -78	19:39305
CONF-810667-	(Enlarged halden programme group meeting on process computer applications, Fredrikstad, Norway, 14-19 Jun 1981)				
4	*See* EGG-M-05481	E 1.99:	DE85012427	MN -78	19:39287
CONF-810806-	(ANS conference on small break loss of coolant accident analysis in LWR's, Monterey, CA, USA, 25-27 Aug 1981)				
2	*See* LA-UR-81-1507		TI85015349	MN -78	19:39345
CONF-810905-	(ANS/ENS topical meeting on probabilistic risk assessment, Port Chester, NY, USA, 20-24 Sep 1981)				
33	*See* EGG-M-01281		TI85013803	MN -78	19:39285
CONF-820163-	(Winter college on nuclear physics and reactors, Trieste, Italy, 25 Jan-19 Mar 1982)				
Pt.1	*See* IAEA-SMR-93		DE85781405	MN -34C	19:39175
CONF-8206271-	(22. annual international conference of the Canadian Nuclear Association, Toronto, Ontario, Canada, 6-9 Jun 1982)				
18	*See* INIS-mf-9592		DE85781351	MN -2	19:39134
CONF-8206275-	(9. annual meeting of the Microscopical Society of Canada, Edmonton, Alberta, Canada, 11-13 Jun 1982)				
	See INIS-mf-9645		DE85781446	MN -37	19:40067
CONF-8209273-	(IAEA specialist meeting on repair aspects and procedures, Roskilde, Denmark, 14-16 Sep 1982)				
1	*See* AECL-7546		DE85701656	MN -80	19:39133
CONF-821050-	(Cyclotron facility workshop, Bloomington, IN, USA, 27-31 Oct 1982)				
	AIP Conf. Proc., No. 57, 226(1983)				19:40677
	AIP Conf. Proc., No. 57, 148(1983)				19:40698
	AIP Conf. Proc., No. 57, 389-397(1983)				19:40858
	AIP Conf. Proc., No. 57, 121-142(1983)				19:40859
	AIP Conf. Proc., No. 57, 149(1983)				19:40860
	AIP Conf. Proc., No. 57, 378-388(1983)				19:40861
CONF-8210133-	(8. All-Union conference on the charged particle accelerators, Protvino, USSR, 19-21 Oct 1982)				
Vol.1	*See* INIS-SU-289		DE85781267	MN -20	19:39792
CONF-8211206-	(Seminar on uranium and nuclear issues, Toronto, Ontario, Canada, 2-3 Nov 1982)				
	See INIS-mf-9644		DE85781436	MN -2	19:39398
CONF-8211207-	(Seminar on nutrient processing and biomass production in New Zealand estuaries, Nelson, New Zealand, 10-11 Nov 1982)				
	See WSD-Misc-60		DE85781281	MN -11	19:40199
CONF-830288-	(Symposium on archaeological science in the Pacific region, Dunedin, New Zealand, 2-7 Feb 1983)				
Absts.	*See* INIS-mf-9655		DE85781441	MN -4	19:40340
CONF-830308-	(American Institute of Chemical Engineers national meeting, Houston, TX, USA, 27-31 Mar 1983)				
15	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015048	MN -90d	19:38665
CONF-8303116-	(Workshop on acid deposition causes and effects - a state assessment model, Gainesville, FL, USA, 23-24 Mar 1983)				
1	*See* BNL-36723	E 1.99:	DE85014820	MN -11	19:40182
CONF-8304224-	(C.E.C. technical session on rock mechanics: advance in laboratory sample testing, Brussels, Belgium, 27 Apr 1983, 27 Apr 1983)				
	See EUR-8748		DE85701670	MN -70	19:38882
CONF-830538-	(6. international conference on radiation shielding, Tokyo, Japan, 16-20 May 1983)				
Pt.2	Tokai, Japan; Japan Atomic Energy Research Institute (1983).				19:41056
CONF-8305259-	(Canadian Nuclear Society commissioning symposium, Toronto, Ontario, Canada, 3 May 1983)				
4	*See* INIS-mf-9635		DE85781419	MN -80	19:39136
5	*See* INIS-mf-9636		DE85781420	MN -80	19:39137
6	*See* INIS-mf-9637		DE85781421	MN -80	19:39138
7	*See* INIS-mf-9638		DE85781422	MN -80	19:39139
8	*See* INIS-mf-9639		DE85781423	MN -80	19:39140
9	*See* INIS-mf-9640		DE85781424	MN -80	19:39207
10	*See* INIS-mf-9641		DE85781425	MN -80	19:39337
11	*See* INIS-mf-9642		DE85781426	MN -80	19:39208
12	*See* INIS-mf-9643		DE85781427	MN -80	19:39141

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CONF-8305262-	(10. annual meeting of the Microscopical Society of Canada, Chalk River, Ontario, Canada, 17-19 May 1983)				
Summ.	*See* INIS-mf-9646		DE85781447	MN -37	19:40071
CONF-830660-	(23. annual international conference of Canadian Nuclear Association, Montreal, Canada, 12-15 Jun 1983)				
19	*See* INIS-mf-9608		DE85781349	MN -80	19:39135
CONF-8306262-	(Belgian Nuclear Society annual meeting on advanced uses of accelerators on the nuclear fuel cycle, Brussels, Belgium, 13-14 Jun 1983)				
5	*See* INIS-mf-9426		DE85781443	MN -28	19:39791
CONF-8307129-	(Flat-plate solar array project research forum on the high-speed growth and characterization of crystals for solar cells, Port St. Lucie, FL, USA, 25-17 Jul 1983)				
	See DOE/JPL-1012-95	E 1.99:	DE84014619	STD -63b	19:39000
CONF-8307152-	(Research co-ordination meeting on isotopic tracer-aided studies of unextractable of bound pesticide residues in soil, plants and food, Neuherberg, F.R. Germany, 11-15 Jul 1983)				
	See IAEA-TECDOC-306		DE85781282	MN -48	19:40166
CONF-8307156-	(NATO advanced study institute, Pascoli, Italy, 1 Jul 1983)				
1	*See* LA-UR-85-225	E 1.99:	DE85005964	MN -34A	19:40973
2	*See* LA-UR-85-226	E 1.99:	DE85005963	MN -21	19:40974
CONF-830805-	(7. international conference on structural mechanics in reactor technology, Chicago, IL, USA, 22-26 Aug 1983)				
	Nucl. Eng. Des., 79: No. 2, 137-143(May 1984)				19:39155
	Nucl. Eng. Des., 79: No. 2, 175-185(May 1984)				19:39188
	Nucl. Eng. Des., 79: No. 2, 199-202(May 1984)				19:39189
	Nucl. Eng. Des., 79: No. 2, 203-209(May 1984)				19:39190
	Nucl. Eng. Des., 79: No. 2, 211-216(May 1984)				19:39191
	Nucl. Eng. Des., 79: No. 2, 229-241(May 1984)				19:39371
CONF-830841-	(Cryogenic engineering conference, Colorado Springs, CO, USA, 15-19 Aug 1983)				
	New York, NY; Plenum Press (1984).				19:39739
CONF-830969-	(12. international conference on solid state nuclear track detectors, Acapulco, Mexico, 4-10 Sep 1983)				
	Nucl. Tracks, 8: No. 1-4, 215-218(1984)				19:40054
	Nucl. Tracks, 8: No. 1-4, 289-292(1984)				19:40055
CONF-8309103-	(9. international vacuum congress and 5. international conference on solid surfaces, Madrid, Spain, 26 Sep-1 Oct 1983)				
	Fusion Technol., 6: No. 2, 465-474(Sep 1984)				19:39578
	Fusion Technol., 6: No. 2, 434-446(Sep 1984)				19:41022
	Fusion Technol., 6: No. 2, 327-334(Sep 1984)				19:41047
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	Fusion Technol., 6: No. 2, 357-363(Sep 1984)				19:41049
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	Fusion Technol., 6: No. 2, 384-392(Sep 1984)				19:41051
	Fusion Technol., 6: No. 2, 364-371(Sep 1984)				19:41052
CONF-8309239-	(11. international symposium on nuclear electronics, Bratislava, Czechoslovakia, 13-16 Sep 1983)				
	See JINR-D-13-84-53		DE85781324	MN -28	19:39779
CONF-8309278-	(Nuclear inter jura '83, San Francisco, CA, USA, 11-15 Sep 1983)				
1	*See* INIS-mf-9517		DE85781355	MN -2	19:38863
2	*See* INIS-mf-9515		DE85781356	MN -2	19:39389
3	*See* INIS-mf-9516		DE85781357	MN -2	19:39390
4	*See* INIS-mf-9519		DE85781358	MN -2	19:39331
5	*See* INIS-mf-9521		DE85781359	MN -2	19:39333
6	*See* INIS-mf-9520		DE85781400	MN -2	19:39332
7	*See* INIS-mf-9513		DE85781401	MN -2	19:39387
8	*See* INIS-mf-9514		DE85781402	MN -2	19:39388
9	*See* INIS-mf-9518		DE85781403	MN -2	19:39391
CONF-8310198-	(IAEA specialists on mechanical properties of structural materials, Chester, UK, 10-14 Oct 1983)				
Vol.1	*See* IWGFR-49-Vol.1		DE85781280	MN -79h	19:39547
CONF-8310374-	(Specialists' meeting on systems and methods for aiding nuclear power plant operators during normal and abnormal conditions, Balatonaliga, Hungary, 4-6 Oct 1983)				
	See INIS-mf-9479		DE85781346	MN -80	19:39109
CONF-8310381-	(11. meeting on flow in porous media, Rio de Janeiro, RJ, Brazil, 19-21 Oct 1983)				
1	*See* INIS-BR-247		DE85781442	MN -38	19:39754
CONF-8310394-	(AIME-ASM fall meeting, Philadelphia, PA, USA, 1 Oct 1983)				
1	*See* IS-M-538	E 1.99:	DE85015518	MN -25	19:39523
CONF-8311246-	(4. Brazilian meeting on reactor physics, Itaipava, RJ, Brazil, 3-5 Nov 1983)				
	See INIS-BR-260		DE85781434	MN -80	19:39124

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CONF-8311247-	(Final research co-ordination meeting on high-dose standardization and intercomparison for industrial radiation processing, Munich, F.R. Germany, 8-11 Nov 1983)				
	See IAEA-TECDOC-321		DE85781407	MN -23	19:40893
CONF-8311251-	(3. spent fuel workshop, Boston, MA, USA, 10-11 Nov 1983)				
	See SKBF-KBS-TR-83-76		DE85781316	MN -70	19:38932
CONF-8311259-	(2. congress of the French Association for Applied Algology, Saint-Vallier, France, 27-28 Nov 1983)				
1	*See* CEA-CONF-7201		DE85752293	MN -61	19:38997
CONF-8312112-	(C.E.C. technical session on computer modelling of stresses in rock, Brussels, Belgium, 6-7 Dec 1983)				
	See EUR-9355		DE85701678	MN -70	19:38890
CONF-840199-	(APRIA colloquium, Paris, France, 23-24 Jan 1984)				
1	*See* CEA-CONF-7348		DE85752292	MN -61G	19:38998
CONF-840307-	(Waste management '84, Tucson, AZ, USA, 11-15 Mar 1984)				
52	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015044	MN -71	19:38845
CONF-840379-	(4. course on fundamental interactions in low energy systems, Erice, Italy, 31 Mar-6 Apr 1984)				
2	*See* CERN-EP-84-85		DE85901050	MN -34D	19:40501
CONF-8403200-	(Seminar of the Gesellschaft fuer Strahlen- und Umweltforschung mbH Muenchen, Munich, F.R. Germany, 1 Mar 1984)				
	See GSF-A-6-84		DE85752362	MN -48	19:40309
CONF-8404243-	(Workshop on the future of intermediate energy physics in Europe, Freiburg im Breisgau, F.R. Germany, 10-13 Apr 1984)				
	See INIS-mf-9311		DE85781453	MN -34D	19:40497
CONF-8404244-	(7. all-union conference on problems of quantum field theory, Alushta, USSR, 21-25 Apr 1984)				
2	*See* JINR-E-2-84-257		DE85701700	MN -34D	19:40625
3	*See* JINR-E-2-84-228		DE85701699	MN -34D	19:40624
CONF-840512-	(6. congress of the International Radiation Protection Association, Berlin, F.R. Germany, 7-12 May 1984)				
22	*See* UCRL-88332	E 1.99:	DE85013972	MN -41	19:40915
CONF-8405179-	(International conference on theoretical approaches to heavy ion reaction mechanisms, Paris, France, 14-18 May 1984)				
	See CEA-N-2406		DE85751948	MN -34C	19:40645
CONF-8405211-	(Workshop on elementary excitations and fluctuations in magnetic systems, San Miniato, Italy, 28 May-1 Jun 1984)				
2	*See* CEA-CONF-7351		DE85751925	MN -25	19:39606
CONF-8405314-	(10. Brazilian meeting on ore treatment and hydrometallurgy, Belo Horizonte, MG, Brazil, 23-25 May 1984)				
1	*See* NUCLEBRAS-CDTN-474		DE85781076	MN -86	19:38830
2	*See* NUCLEBRAS-CDTN-476		DE85781077	MN -86	19:38831
3	*See* NUCLEBRAS-CDTN-477		DE85781078	MN -86	19:38832
4	*See* NUCLEBRAS-CDTN-479		DE85781081	MN -25	19:39689
CONF-8406186-	(59. Nobel symposium - the physics of chaos and related phenomena, Graeftavallen, Sweden, 11-16 Jun 1984)				
	Phys. Scr., T9: 50-58(1985)				19:40950
CONF-8406198-	(Design and utilization of the superconducting super collider summer study, Snowmass, CO, USA, 23 Jun-13 Jul 1984)				
45	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85013896	MN -34C	19:40557
CONF-8406254-	(Canadian Association of Physicists annual meeting, Sherbrook, Canada, 18 Jun 1984)				
1	*See* RAL-84-057		DE85701760	MN -20	19:40989
CONF-840781-	(International conference on environmental contamination, London, UK, 10-13 Jul 1984)				
3	*See* GKSS-84/E/45		DE85752201	MN -11	19:40186
CONF-840795-	(7. European symposium on antiproton interactions, Durham, UK, 9-13 Jul 1984)				
7	*See* RAL-84-087		DE85781046	MN -34D	19:40539
CONF-8407124-	(1. meeting of the luminescence group of the European section of the Electrochemical Society, Meudon-Bellevue, France, 16-17 Jul 1984)				
1	*See* CEA-CONF-7410		DE85751991	MN -10	19:39889
CONF-8407130-	(Conference on gamma-ray bursts, Palo Alto, CA, USA, 30 Jul-3 Aug 1984)				
1	*See* LA-UR-85-2005	E 1.99:	DE85014126	MN -34B	19:40413
CONF-8407131-	(Bureau of Mines technology transfer seminars, Pittsburgh, PA, USA, 24 Jul 1984)				
	See BM-IC-8986		TI85901533	MN -90i	19:40317
CONF-8407132-	(Bureau of Mines technology transfer seminars, Denver, CO, USA, 26 Jul 1984)				
	See BM-IC-8986		TI85901533	MN -90i	19:40317

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CONF-840802-	(ANS International topical meeting on fuel reprocessing and waste management, Jackson Hole, WY, USA, 26-29 Aug 1984)				
26	*See* CEA-CONF-7471		DE85751987	MN -86	19:38839
27	*See* CEA-CONF-7472		DE85751989	MN -83	19:38840
CONF-840810-	(International geoscience and remote sensing symposium, Strasbourg, France, 27-30 Aug 1984)				
1	*See* GKSS-84/E/49		DE85752202	MN -11	19:40129
2	*See* GKSS-84/E/50		DE85752203	MN -11	19:40130
CONF-840819-	(Doing better: setting an agenda for the second decade, Santa Cruz, CA, USA, 14-22 Aug 1984)				
18	*See* LBL-18669	E 1.99:	DE85014539	MN -95d	19:39444
19	*See* LBL-17593	E 1.99:	DE85015126	MN -95d	19:39443
CONF-8408121-	(American Institute of Physics conference, Taos, NM, USA, 6-11 Aug 1984)				
5	*See* LA-UR-85-2092	E 1.99:	DE85014107	MN -34B	19:40430
CONF-8408122-	(4. international conference on nuclear war, Erice, Sicily, Italy, 19-24 Aug 1984)				
6	*See* UCRL-92942	E 1.99:	DE85015187	MN -11	19:40132
CONF-8408138-	(6. general conference of the European Physical Society, Prague, Czechoslovakia, 27-31 Aug 1984)				
2	*See* RAL-84-088		DE85781047	MN -34D	19:40600
CONF-8408141-	(4. international conference on physics in collision, Santa Cruz, CA, USA, 22-24 Aug 1984)				
7	*See* RAL-84-094		DE85701772	MN -34D	19:40601
CONF-8408147-	(12. international laser radar conference, Aix-en-Provence, France, 13-27 Aug 1984)				
2	*See* CEA-CONF-7383		DE85752294	MN -11	19:40122
CONF-8408159-	(4. Japan-Brazil symposium on science and technology, Rio de Janeiro;Sao Paulo, Brazil, 6-9 Aug 1984)				
Vol.4	*See* INIS-BR-279		DE85781265	MN -34A	19:41065
CONF-8408160-	(NATO Advanced Study Institute on techniques and concepts of high energy physics, St. Croix, VI, USA, 2-13 Aug 1984)				
Pt.1	*See* DESY-84-123		DE85752006	MN -34D	19:40610
CONF-8408161-	(Energy and More in '84, Salt Lake City, UT, USA, 27-29 Aug 1984)				
	Am. Assoc. Pet. Geol., Bull., 68: No. 7, 946(Jul 1984)				19:38721
	Am. Assoc. Pet. Geol., Bull., 68: No. 7, 943(Jul 1984)				19:39047
CONF-840901-	(ANS topical meeting on reactor physics and shielding, Chicago, IL, USA, 17-19 Sep 1984)				
25	*See* PNL-SA-12186	E 1.99:	DE85013497	MN -78	19:39365
CONF-8409109-	(Industrial temperature measurement symposium, Knoxville, TN, USA, 10-12 Sep 1984)				
8	*See* CEA-CONF-7437		DE85751990	MN -80	19:39185
CONF-8409112-	(CSNI specialist meeting on aerosols in reactor safety, Karlsruhe, F.R. Germany, 4-6 Sep 1984)				
	See KFK-3800			ND -80	19:39344
CONF-8409121-	(2. international conference on fatigue thresholds - Fatigue 84, Birmingham, UK, 3-7 Sep 1984)				
3	*See* CEA-CONF-7436		DE85751924	MN -25	19:39482
CONF-8409162-	(6. international symposium on high energy spin physics, Marseille, France, 12-19 Sep 1984)				
15	*See* BNL-36181	E 1.99:	DE85012517	MN -34D	19:39805
CONF-8409164-	(NATO advanced study institute on physics and engineering of medical imaging, Maratea, Italy, 24 Sep-5 Oct 1984)				
3	*See* CEA-CONF-7542		DE85751947	MN -48	19:40212
4	*See* CEA-CONF-7543		DE85751992	MN -41	19:40213
5	*See* CEA-CONF-7544		DE85751993	MN -48	19:40214
6	*See* CEA-CONF-7545		DE85751994	MN -48	19:40215
CONF-8409194-	(6. international workshop on photon-photon collisions, Lake Tahoe, CA, USA, 9-13 Sep 1984)				
6	*See* DESY-85-006		DE85752007	MN -34D	19:40559
CONF-8409198-	(Conference on hemoglobin switching, Airlie, VA, USA, 30 Sep-3 Oct 1984)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85005364	MN -48	19:40233
CONF-8409234-	(International Atomic Energy Agency consultants meeting on separations in chemical analysis, Vienna, Austria, 12-14 Sep 1984)				
1	*See* CEA-CONF-7418		DE85751945	MN -10	19:38838
CONF-841010-	(Meeting of the Plasma Physics Division of the American Physical Society, Boston, MA, USA, 27 Oct-3 Nov 1984)				
17	*See* DOE/DP/40124-65	E 1.99:	DE85014410	MN -21	19:41028
CONF-841041-	(23. Hanford Life Sciences symposium--interaction of biological systems with static and ELF electric and magnetic fields, Richland, WA, USA, 2-4 Oct 1984)				
2	*See* LBL-18384	E 1.99:	DE85015225	MN -48	19:40318
CONF-8410224-	(AIP conference on neutrino mass and gauge structure of weak interaction, Cable, WI, USA, 24-27 Oct 1984)				
9	*See* DOE/ER/03992-577	E 1.99:	DE85014730	MN -34D	19:40563

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CONF-841194-	(Southeast industrial biomass energy exposition, Atlanta, GA, USA, 28-29 Nov 1984)			
	See ANL/CNSV-TM-157	E 1.99: DE85014299	MN -61F	19:38995
CONF-8411108-	(Arctic energy technologies workshop, Morgantown, WV, USA, 14-15 Nov 1984)			
	See DOE/METC-85/6014	E 1.99: DE85003360	STD -92a	19:38786
CONF-8411176-	(Historically black colleges and universities invitational working session, Washington, DC, USA, 8-9 Nov 1984)			
Summ.	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014907	MN -13	19:41058
CONF-841201-	(ASME winter annual meeting, New Orleans, LA, USA, 9-13 Dec 1984)			
33	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85014347	MN -90e	19:38757
CONF-841270-	(VDI/GFT working group, Berlin, F.R. Germany, 3 Dec 1984)			
1	NTIS (US Sales Only), PC A03/MF A01; 1	DE85770323	MN -96	19:39468
CONF-841271-	(Seminar on vehicle technology, Karlsruhe, F.R. Germany, 11 Dec 1984)			
1	NTIS (US Sales Only), PC A03/MF A01; 1	DE85770324	MN -96	19:39472
CONF-850103-	(2. symposium on space nuclear power systems, Albuquerque, NM, USA, 14-16 Jan 1985)			
11	*See* EGG-M-13484	E 1.99: DE85014634	MN -80	19:39156
CONF-850104-	(9. annual symposium on energy from biomass and wastes, Lake Buena Vista, FL, USA, 28 Jan-1 Feb 1985)			
7	*See* EGG-M-00185	E 1.99: DE85014593	MN -61F	19:38984
CONF-850146-	(Aspen winter physics conference, Aspen, CO, USA, 14-19 Jan 1985)			
8	*See* DOE/ER/40025-36	E 1.99: DE85014901	MN -34D	19:40509
CONF-850148-	(Ignition studies mission 2 meeting, Los Angeles, CA, USA, 31 Jan 1985)			
1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85006919	MN -20b	19:41025
CONF-850152-	(3. LEAR workshop, Tignes-Savoie, France, 19-26 Jan 1985)			
6	*See* DOE/ER/03244-110	E 1.99: DE85014325	MN -34D	19:40505
CONF-850169-	(7. international conference on positron annihilation, New Delhi, India, 6-11 Jan 1985)			
14	*See* BNL-36415	E 1.99: DE85014212	MN -25	19:39603
15	*See* LBL-19481	E 1.99: DE85014540	MN -34D	19:40225
16	*See* BNL-36700	E 1.99: DE85014831	MN -34A	19:39605
17	*See* BNL-36701	E 1.99: DE85014830	MN -34A	19:39481
18	*See* BNL-36699	E 1.99: DE85014832	MN -34A	19:39480
CONF-850172-	(Symposium on anelastic relaxations and magnetic after effect in solids - Reniom 84, Kattowice, Poland, 24-26 Jan 1985)			
1	*See* CEA-CONF-7500	DE85751944	MN -25	19:39483
CONF-850173-	(23. international winter meeting on nuclear physics, Bormio, Italy, 21-26 Jan 1985)			
1	*See* GSI-85-13-Prepr.	DE85752011	MN -34C	19:40730
CONF-850278-	(5. topical workshop on proton-anti-proton collider physics, St. Vincent, Italy, 25 Feb-1 Mar 1985)			
2	*See* SLAC-PUB-3686	E 1.99: DE85014365	MN -34D	19:40545
CONF-850287-	(Workshop on the inter-relationship among interstellar, circumstellar, and interplanetary grains, Wye, MD, USA, 27 Feb-1 Mar 1985)			
1	*See* LA-UR-85-1979	E 1.99: DE85014133	MN -34B	19:40411
CONF-850314-	(Waste management '85, Tucson, AZ, USA, 24-28 Mar 1985)			
71	*See* EGG-M-21484	E 1.99: DE85014619	MN -70	19:38881
72	*See* EGG-M-06885	E 1.99: DE85014627	MN -70B	19:38880
CONF-850315-	(Conference on antinucleon and nucleon-nucleus interactions, Telluride, CO, USA, 18-21 Mar 1985)			
8	*See* LA-UR-85-2075	E 1.99: DE85014113	MN -34C	19:40854
9	*See* DOE/ER/03244-111	E 1.99: DE85014326	MN -34D	19:40506
CONF-850345-	(Southwest conference on optics, Albuquerque, NM, USA, 4-8 Mar 1985)			
27	*See* LA-UR-85-1999	E 1.99: DE85014127	MN -37	19:40090
CONF-850354-	(10. international technical conference on slurry technology, Lake Tahoe, NV, USA, 26-28 Mar 1985)			
1	*See* IS-M-546	E 1.99: DE85015521	MN -90b	19:38754
CONF-850375-	(20. Recontre de Moriond, Les Arcs, France, 10-23 Mar 1985)			
9	*See* DOE/ER/40033-78	E 1.99: DE85013596	MN -34D	19:40510
11	*See* SLAC-PUB-3676	E 1.99: DE85014364	MN -34D	19:40543
12	*See* UCRL-92789	E 1.99: DE85014182	MN -34B	19:40414
13	*See* LBL-19618	E 1.99: DE85014530	MN -34D	19:40534
14	*See* ANL/HEP-CP-85-32	E 1.99: DE85014978	MN -34D	19:40548
15	*See* BNL-36726	E 1.99: DE85015183	MN -34D	19:40500
CONF-8503120-	(Hadronic probes and nuclear interactions conference, Tempe, AZ, USA, 11-14 Mar 1985)			
5	*See* LA-UR-85-2225	E 1.99: DE85014080	MN -28	19:39862
CONF-8503131-	(4. Oxford conference on microscopy of semiconducting materials, Oxford, UK, 25-27 Mar 1985)			
3	*See* SERI/TP-212-2753	E 1.99: DE85012134	MN -63	19:39002

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CONF-8503139-	(Free-lagrangian methods conference, Hilton Head Island, SC, USA, 4-6 Mar 1985)			
2	*See* UCRL-92385	E 1.99: DE85012946	MN -34	19:40487
CONF-8503141-	(Symposium on anomalies, geometry and topology, Argonne, IL, USA, 28-30 Mar 1985)			
2	*See* SLAC-PUB-3698	E 1.99: DE85014354	MN -34D	19:40638
3	*See* LBL-19671	E 1.99: DE85014537	MN -34D	19:40637
CONF-8503146-	(San Miniato topical seminar, San Miniato, Italy, 25-29 Mar 1985)			
1	*See* ANL-HEP-CP-85-18	E 1.99: DE85012125	MN -34D	19:40499
CONF-8503151-	(International symposium on physics of proton-anti-proton collision, Tsukuba, Japan, 13-15 Mar 1985)			
2	*See* FNAL/C-85/84	E 1.99: DE85014782	MN -34D	19:40514
CONF-8503152-	(5. European Physical Society general conference of Condensed Matter Division, West Berlin, Germany D.R., 18-22 Mar 1985)			
1	*See* DOE/ER/45025-7	E 1.99: DE85014444	MN -25	19:39495
CONF-8503153-	(Aerospace computer security conference, McLean, VA, USA, 20 Mar 1985)			
1	*See* EGG-M-01285	E 1.99: DE85014629	MN -33A	19:41081
CONF-8503154-	(International conference on robotics research, St. Louis, MI, USA, 25 Mar 1985)			
1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85009479	MN -32	19:41078
CONF-850405-	(2. national topical meeting on tritium technology in fission, fusion and isotopic applications, Dayton, OH, USA, 30 Apr-2 May 1985)			
16	*See* GA-A-17940	E 1.99: DE85014783	MN -20d	19:41034
CONF-850406-	(International symposium and workshop on particulate and multi-phase processes and the 16th annual meeting of the Fine Particle Society, Miami Beach, FL, USA, 22-26 Apr 1985)			
12	*See* BNL-36667	E 1.99: DE85015193	MN -90e	19:38756
13	*See* BNL-36665	E 1.99: DE85015192	MN -38	19:39751
CONF-850410-	(ANS/ENS fast reactor safety meeting, Knoxville, TN, USA, 21-24 Apr 1985)			
54	*See* HEDL-SA-3249-FP	E 1.99: DE85013734	MN -79p	19:39309
55	*See* HEDL-SA-3224-FP	E 1.99: DE85013736	MN -79p	19:39306
56	*See* HEDL-SA-3234-FP	E 1.99: DE85013746	MN -79p	19:39307
57	*See* HEDL-SA-3241-FP	E 1.99: DE85013744	MN -79	19:39308
CONF-850420-	(2. specialists' meeting on decay heat removal and natural convection in LMFBRs, Long Island, NY, USA, 17-19 Apr 1985)			
5	*See* BNL-NUREG-36636	TI85014216	MN -79k	19:39246
CONF-850464-	(Coal preparation conference and exhibition, Lexington, KY, USA, 30 Apr-2 May 1985)			
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85014346	MN -90b	19:38740
CONF-850470-	(4. international conference on electrostatic accelerator technology and associated boosters, Buenos Aires, Argentina, 15-19 Apr 1985)			
6	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014651	MN -28	19:39834
CONF-850473-	(Seminar on the speciation of fission products in the environment, Oxford, UK, 16-19 Apr 1985)			
4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015414	MN -48	19:40264
CONF-850474-	(Sherwood theory conference, Madison, WI, USA, 15-17 Apr 1985)			
1	*See* DOE/ET/51013-148	E 1.99: DE85015579	MN -20	19:40963
CONF-850484-	(Penetration phenomena workshop, Oak Ridge, TN, USA, 14-16 Apr 1985)			
2	*See* UCRL-92912	E 1.99: DE85014813	MN -34D	19:40415
CONF-8504100-	(2. Copper Mountain conference on multigrid methods, Copper Mountain, CO, USA, 1-3 Apr 1985)			
2	*See* EGG-M-07685	E 1.99: DE85014632	MN -32	19:41082
CONF-8504102-	(66. American Welding Society annual meeting, Las Vegas, NV, USA, 28 Apr-3 May 1985)			
3	*See* EGG-M-17884	E 1.99: DE85014623	MN -38	19:39762
CONF-8504130-	(10. annual EPRI contractors' conference on coal liquefaction, Palo Alto, CA, USA, 23-25 Apr 1985)			
2	*See* LBL-19694	E 1.99: DE85015133	MN -90d	19:38704
CONF-8504132-	(Japan/United States specialist meeting on remote systems technology, Oak Ridge, TN, USA, 26 Apr-3 May 1985)			
1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85013994	MN -38	19:39716
CONF-8504133-	(International conference on hadron spectroscopy, College Park, MD, USA, 20-22 Apr 1985)			
5	*See* DOE/ER/03244-114	E 1.99: DE85014329	MN -34D	19:40508
6	*See* DOE/ER/03244-113	E 1.99: DE85014328	MN -34D	19:40507
CONF-8504152-	(Workshop on experiments for RHIC, Upton, NY, USA, 15-19 Apr 1985)			
1	*See* BNL-36620	E 1.99: DE85012262	MN -34D	19:40795
2	*See* BNL-36633	E 1.99: DE85014225	MN -34D	19:39888
CONF-8504153-	(NATO advanced studies conference on scaling phenomena in disordered systems, Geilo, Norway, 10-21 Apr 1985)			
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85011432	MN -25	19:39697

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CONF-8504157-	(Synthetic metals III workshop, Los Alamos, NM, USA, 9-12 Apr 1985)			
2	*See* LA-UR-85-2055	E 1.99: DE85014118	MN -34A	19:39617
CONF-8504159-	(National Research Council workshop on electric energy systems research, Washington, DC, USA, 24-26 Apr 1985)			
1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85014653	MN -97	19:39065
CONF-850504-	(Particle accelerator conference, Vancouver, Canada, 13-16 May 1985)			
88	*See* UCRL-92673	E 1.99: DE85012878	MN -28	19:39829
191	*See* SLAC-PUB-3647	E 1.99: DE85014292	MN -28	19:39828
193	*See* SLAC-PUB-3636	E 1.99: DE85014291	MN -28	19:39881
210	*See* LBL-18970	E 1.99: DE85015129	MN -28	19:39817
211	*See* ANL/HEP-CP-85-43	E 1.99: DE85014985	MN -28	19:39787
212	*See* LBL-18954	E 1.99: DE85015249	MN -28	19:39815
213	*See* LBL-18958	E 1.99: DE85015251	MN -28	19:39865
214	*See* LBL-18952	E 1.99: DE85015250	MN -48	19:40223
215	*See* BNL-36626	E 1.99: DE85014827	MN -28	19:39788
216	*See* LBL-19565	E 1.99: DE85015275	MN -28	19:39821
217	*See* LBL-19603	E 1.99: DE85015274	MN -28	19:39822
218	*See* LBL-18960	E 1.99: DE85015116	MN -28	19:39816
219	*See* LBL-19485	E 1.99: DE85015128	MN -28	19:39818
220	*See* LBL-18939	E 1.99: DE85015130	MN -28	19:39864
221	*See* LBL-18964	E 1.99: DE85015271	MN -28	19:39867
222	*See* LBL-18965	E 1.99: DE85015273	MN -28	19:39868
223	*See* LBL-18951	E 1.99: DE85015272	MN -48	19:40222
224	*See* LBL-19579	E 1.99: DE85015277	MN -28	19:39799
225	*See* LBL-19593	E 1.99: DE85015278	MN -28	19:39800
226	*See* LBL-18961	E 1.99: DE85015279	MN -28	19:39866
227	*See* LBL-19011	E 1.99: DE85015276	MN -28	19:39870
228	*See* LBL-19564	E 1.99: DE85015281	MN -28	19:39820
229	*See* LBL-19563	E 1.99: DE85015280	MN -28	19:39819
230	*See* LBL-18967	E 1.99: DE85015206	MN -28	19:39869
231	*See* ANL/HEP-CP-85-40	E 1.99: DE85014977	MN -28	19:39831
232	*See* ANL/HEP-CP-85-42	E 1.99: DE85014983	MN -28	19:39804
236	*See* LBL-18978	E 1.99: DE85015247	MN -48	19:40224
CONF-850507-	(International conference on nuclear data for basic and applied science, Santa Fe, NM, USA, 13-17 May 1985)			
34	*See* PNL-SA-12858	E 1.99: DE85013040	MN -34C	19:40721
35	*See* BNL-NCS-36379	E 1.99: DE85013297	MN -34C	19:40775
46	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014649	MN -34C	19:40646
47	*See* EGG-M-12685	E 1.99: DE85014567	MN -34C	19:40778
CONF-850533-	(6. symposium on X- and gamma-ray sources and applications, Ann Arbor, MI, USA, 21-23 May 1985)			
10	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85013865	MN -37	19:39890
CONF-850579-	(4. topical conference on computerized data acquisition in particle and nuclear physics, Chicago, IL, USA, 19-24 May 1985)			
2	*See* BNL-36606	E 1.99: DE85012272	MN -34D	19:40663
5	*See* SLAC-PUB-3680	E 1.99: DE85013069	MN -34D	19:40544
6	*See* LA-UR-85-1756	E 1.99: DE85012748	MN -34C	19:40878
11	*See* BNL-36605	E 1.99: DE85012260	MN -34C	19:39833
CONF-8505112-	(2. international symposium on the biology and toxicology of metals using nuclear analytical methods, Upton, NY, USA, 20-22 May 1985)			
1	*See* BNL-36757	E 1.99: DE85014833	MN -48	19:40302
CONF-8505138-	(Materials and mechanisms of superconductivity conference, Ames, IA, USA, 29-31 May 1985)			
10	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014912	MN -25	19:39490
11	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015000	MN -25	19:39587
12	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85014973	MN -25	19:39491
13	*See* BNL-36647	E 1.99: DE85014829	MN -34D	19:40930
14	*See* IS-M-553	E 1.99: DE85015260	MN -34	19:40931
CONF-8505139-	(9. annual actinide separations workshop, Richland, WA, USA, 22-24 May 1985)			
4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85013885	MN -86	19:38841
CONF-8505157-	(IBM conference on vector and parallel computations for scientific computing, Rome, Italy, 28 May 1985)			
1	*See* UCRL-92077-II	E 1.99: DE85013197	MN -32	19:41076
CONF-8505167-	(Conference on conservation in buildings: northwest perspective, Butte, MT, USA, 20-22 May 1985)			
3	*See* LBL-19492	E 1.99: DE85014544	MN -95d	19:39445
CONF-8505172-	(Conference on nuclear structure with heavy ions, Legnaro, Padua, Italy, 27-31 May 1985)			
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014989	MN -34C	19:40751
CONF-8505174-	(IDA workshop on gamma-ray lasers, Alexandria, VA, USA, 21-22 May 1985)			
1	*See* LA-UR-85-2119	E 1.99: DE85014103	MN -34C	19:40855
CONF-8505175-	(TPSS meeting, Atlanta, GA, USA, 15-16 May 1985)			
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85013638	MN -20	19:41027

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CONF-8505178-	(Collaborative study on short-term tests for genotoxicity and carcinogenicity, Cap d'Adge, France, 14-21 May 1985)				
1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014315	MN -48	19:40303
CONF-8505180-	(Symposium on groundwater flow and transport modeling for performance assessment of deep geologic disposal of radioactive waste, Albuquerque, NM, USA, 20-21 May 1985)				
1	*See* SAND-85-0829C	E 1.99:	TI85014333	MN -70	19:38950
2	*See* SAND-85-0773C	E 1.99:	DE85015152	MN -70	19:38930
CONF-8505181-	(7. annual international ISPA conference, Orlando, FL, USA, 7-10 May 1985)				
1	*See* EGG-M-08685	E 1.99:	DE85009830	MN -38	19:39718
CONF-8505183-	(Symposium on biological effects of static and extremely-low-frequency magnetic fields, Neuherberg, F.R. Germany, 13-15 May 1985)				
1	*See* LBL-19711	E 1.99:	DE85015197	MN -48	19:40319
CONF-8505184-	(Materials Research Society Europe conference, Strasbourg, France, 13-15 May 1985)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015040	MN -25	19:39609
CONF-850604-	(INTERSOL '85 - Solar energy--the diverse solution, Montreal, Canada, 23-29 Jun 1985)				
12	*See* SERI/TP-252-2738	E 1.99:	DE85012142	MN -64	19:39018
CONF-850605-	(7. international conference on laser spectroscopy, Maui, HI, USA, 24-28 Jun 1985)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014650	MN -34A	19:40438
CONF-850606-	(American Society of Heating, Refrigerating and Air-Conditioning Engineers' semiannual meeting, Honolulu, HI, USA, 23-27 Jun 1985)				
10	*See* SAND-85-1440C	E 1.99:	DE85013747	MN -38	19:39734
CONF-850607-	(AIAA thermophysics conference, Williamsburg, VA, USA, 18-20 Jun 1985)				
5	*See* LA-UR-85-2093	E 1.99:	DE85014105	MN -34	19:40459
CONF-850609-	(25. annual international conference of the Canadian Nuclear Association and 6. annual conference of the Canadian Nuclear Society, Ottawa, Ontario, Canada, 2-5 Jun 1985)				
1	*See* BNL-NUREG-36715		TI85015184	MN -70B	19:38872
CONF-850610-	(Annual meeting of the American Nuclear Society, Boston, MA, USA, 9-14 Jun 1985)				
31	*See* HEDL-SA-3253-FP	E 1.99:	DE85013729	MN -83	19:39441
CONF-850616-	(5. IEEE pulsed power conference, Washington, DC, USA, 10-12 Jun 1985)				
54	*See* LA-UR-85-1993	E 1.99:	DE85014130	MN -38	19:39780
58	*See* LA-UR-85-2057	E 1.99:	DE85014117	MN -28	19:39860
60	*See* LA-UR-85-2022	E 1.99:	DE85014123	MN -38	19:39782
64	*See* LA-UR-85-2021	E 1.99:	DE85014124	MN -38	19:39781
CONF-850631-	(3. international symposium on catalyst deactivation and poisoning, Berkeley, CA, USA, 19-21 Jun 1985)				
1	*See* LBL-19766	E 1.99:	DE85015127	MN -93A	19:39428
CONF-850634-	(International school for intermediate energy nuclear physics, Veronna, Italy, 20-30 Jun 1985)				
1	*See* BNL-36655	E 1.99:	DE85014229	MN -34C	19:40796
CONF-850635-	(4. international symposium on neutron induced reactions, Smolenice, Czechoslovakia, 17-21 Jun 1985)				
2	*See* BNL-36646	E 1.99:	DE85014191	MN -34C	19:40664
CONF-850646-	(2. international specialists meeting on small break LOCA analysis in LWRs, Pisa, Italy, 24-26 Jun 1985)				
9	*See* EGG-M-10385		TI85014571	MN -78	19:39289
CONF-850666-	(23. symposium on engineering aspects of magnetohydrodynamics, Somerset, PA, USA, 25-28 Jun 1985)				
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014979	MN -90g	19:39417
CONF-850670-	(ASME pressure vessel and piping division conference, New Orleans, LA, USA, 24-29 Jun 1985)				
21	*See* EGG-M-04485	E 1.99:	DE85014574	MN -80	19:39286
CONF-850671-	(26. U.S. symposium on rock mechanics, Rapid City, SD, USA, 26-28 Jun 1985)				
20	*See* RHO-BW-SA-412P	E 1.99:	DE85014938	MN -70	19:38923
CONF-850679-	(18. American Society for Testing and Materials symposium, Boulder, CO, USA, 1 Jun 1985)				
2	NTIS, PC A03/MF A01 - GPO		TI85014654	MN -78	19:39114
CONF-8506100-	(3. IEEE conference on human factors and power plants, Monterey, CA, USA, 23-27 Jun 1985)				
3	NTIS, PC A02/MF A01 - GPO		TI85015043	MN -78	19:39169
CONF-8506130-	(International Committee for Radionuclide Metrology meeting, Grenoble, France, 3-7 Jun 1985)				
4	*See* BNL-NCS-36553	E 1.99:	DE85014217	MN -34C	19:40668
5	*See* BNL-NCS-36554	E 1.99:	DE85014218	MN -34C	19:40724
CONF-8506137-	(4. international conference on environmental mutagens, Stockholm, Sweden, 24-28 Jun 1985)				
7	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014313	MN -48	19:40304
8	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014999	MN -48	19:40305

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CONF-8506141-	(SDIO/DARPA annual propagation review, Monterey, CA, USA, 24-28 Jun 1985)				
3	*See* SAND-85-1338C	E 1.99:	DE85013958	MN -38	19:39824
6	*See* SAND-85-1452C	E 1.99:	DE85014462	MN -28	19:39825
8	*See* SAND-85-1451C	E 1.99:	DE85014709	MN -28	19:39880
CONF-8506142-	(International lens design conference, Cherry Hill, NJ, USA, 10-13 Jun 1985)				
1	*See* LA-UR-85-2062	E 1.99:	DE85014116	MN -37	19:39727
2	*See* LA-UR-85-2035	E 1.99:	DE85014122	MN -32	19:41087
CONF-8506144-	(International conference on the theory of the structures of non-crystalline solids, Bloomfield Hills, MI, USA, 3-6 Jun 1985)				
3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014967	MN -25	19:39492
CONF-8506145-	(2. workshop on spacecraft glow, Huntsville, AL, USA, 17 Jun 1985)				
1	*See* LA-UR-85-2182	E 1.99:	DE85014092	MN -38	19:39728
CONF-8506148-	(Workshop on requirements of mobile teleoperators for radiological emergency response and recovery, Dallas, TX, USA, 23-25 Jun 1985)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013639	MN -38	19:39717
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014310	MN -86	19:38842
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014308	MN -38	19:39766
CONF-8506149-	(Manned mars mission workshop, Huntsville, AL, USA, 10-14 Jun 1985)				
1	*See* LA-UR-85-1990	E 1.99:	DE85014131	MN -34B	19:40412
CONF-8506150-	(Neutralizer workshop, Upton, NY, USA, 5-6 Jun 1985)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014655	MN -34	19:40439
CONF-8506153-	(SP-100 systems selection committee review on fuels and materials conference, Los Alamos, NM, USA, 20 Jun 1985)				
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014658	MN -38	19:39588
CONF-8506159-	(Workshop on dynamical problems in continuum, Minneapolis, MN, USA, 3-7 Jun 1985)				
1	*See* SAND-85-1441C	E 1.99:	DE85015492	MN -25	19:39625
CONF-8506163-	(5. international symposium on forecasting, Montreal, Canada, 9-12 Jun 1985)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014971	MN -98	19:39378
CONF-8506165-	(Workshop on the relation between mechanical properties and micro-structure under fusion irradiation conditions, Ebeltoft, Denmark, 27 Jun-2 Jul 1985)				
1	*See* DOE/ER/10107-28	E 1.99:	DE85014506	MN -20c	19:39494
CONF-850706-	(8. international symposium on detonation, Albuquerque, NM, USA, 15-19 Jul 1985)				
23	*See* UCRL-91485	E 1.99:	DE85014802	MN -45	19:40108
24	*See* UCRL-91490	E 1.99:	DE85014809	MN -45	19:40109
25	*See* UCRL-91484	E 1.99:	DE85014803	MN -45	19:40107
27	*See* UCRL-91460	E 1.99:	DE85015082	MN -45	19:40106
CONF-850708-	(Workshop on tokamak start-up - problems and scenarios related to the transient phases of long-burn operations, Erice, Italy, 14-20 Jul 1985)				
1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015321	MN -20	19:41026
CONF-850710-	(3. international conference on heavy crude and tar sands, Long Beach, CA, USA, 22-31 Jul 1985)				
1	*See* SAND-85-1125C	E 1.99:	DE85014839	MN -92a	19:38790
CONF-850711-	(22. annual conference on nuclear and space radiation effects, Monterey, CA, USA, 22-24 Jul 1985)				
11	*See* SAND-85-0742C	E 1.99:	DE85009813	MN -37	19:40060
CONF-850713-	(International conference on nuclear power plant aging, availability factor and reliability analysis, San Diego, CA, USA, 3-13 Jul 1985)				
1	NTIS, PC A02/MF A01 - GPO		TI85014659	MN -80	19:39248
2	*See* EGG-M-16385	E 1.99:	TI85014631	MN -78	19:39498
CONF-850716-	(7. international conference on ion beam analysis, Berlin, F.R. Germany, 7-12 Jul 1985)				
1	*See* SAND-85-0592C	E 1.99:	DE85014437	MN -25	19:39680
CONF-850720-	(International nuclear reactor decommissioning planning conference, Bethesda, MD, USA, 16-18 Jul 1985)				
1	*See* UNI-SA-147		TI85015098	MN -78	19:39368
2	*See* UNI-SA-149		TI85015099	MN -78	19:39369
CONF-850723-	(7. international system safety conference, San Jose, CA, USA, 25-29 Jul 1985)				
4	*See* RFP-3855	E 1.99:	DE85014904	MN -38	19:39767
5	*See* UCRL-93012	E 1.99:	DE85015175	MN -41	19:38935
CONF-850736-	(American Physical Society topical conference on shock waves in condensed matter, Spokane, WA, USA, 22-26 Jul 1985)				
11	*See* LA-UR-85-2251	E 1.99:	DE85014076	MN -25	19:39550
12	*See* SAND-85-1363C	E 1.99:	DE85013949	MN -45	19:40105
16	*See* UCRL-92231	E 1.99:	DE85014556	MN -34A	19:40465
20	*See* SAND-85-0635C	E 1.99:	DE85014703	MN -25	19:39561
23	*See* UCRL-92080	E 1.99:	DE85014807	MN -45	19:40111
24	*See* UCRL-92255	E 1.99:	DE85014811	MN -34A	19:40941

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25	*See* SAND-85-0317C	E 1.99: DE85014840	MN -34A	19:39590
27	*See* UCRL-92921	E 1.99: DE85014810	MN -34B	19:40488
28	*See* SAND-85-0334C	E 1.99: DE85015139	MN -45	19:40103
29	*See* SAND-85-0308C	E 1.99: DE85015141	MN -34	19:41099
30	*See* SAND-85-1235C	E 1.99: DE85015142	MN -21	19:41044
32	*See* SAND-85-1514C	E 1.99: DE85015144	MN -34A	19:39593
33	*See* SAND-85-0484C	E 1.99: DE85015140	MN -25	19:39560
34	*See* SAND-85-0415C	E 1.99: DE85014707	MN -37	19:40095
35	*See* SAND-85-0497C	E 1.99: DE85015153	MN -45	19:40104
36	*See* SAND-85-1597C	E 1.99: DE85015159	MN -45	19:39563
37	*See* SAND-85-0406C	E 1.99: DE85015156	MN -25	19:39623
38	*See* SAND-85-0383C	E 1.99: DE85015143	MN -45	19:39695
39	*See* SAND-85-0366C	E 1.99: DE85015166	MN -45	19:39559
40	*See* SAND-85-0333C	E 1.99: DE85015165	MN -25	19:39591
41	*See* SAND-85-0156C	E 1.99: DE85015154	MN -25	19:39557
43	*See* SAND-85-0310C	E 1.99: DE85015505	MN -25	19:39622
44	*See* UCRL-92286	E 1.99: DE85015394	MN -25	19:39566
46	*See* LA-UR-85-2311	E 1.99: DE85015686	MN -45	19:40102
47	*See* LA-UR-85-2358	E 1.99: DE85015675	MN -45	19:39688
48	*See* LA-UR-85-2579	E 1.99: DE85015750	MN -37	19:40092
CONF-850755-	(Symposium on physics and chemistry of glass and glassmaking, Alfred, NY, USA, 30 Jul-2 Aug 1985)			
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015007	MN -25	19:39607
CONF-850759-	(10. high pressure conference on research in high pressure science and technology, Amsterdam, Netherlands, 8-11 Jul 1985)			
5	*See* UCRL-92759	E 1.99: DE85014801	MN -25	19:39567
6	*See* UCRL-92924	E 1.99: DE85014812	MN -34B	19:40489
7	*See* UCRL-91872	E 1.99: DE85014815	MN -37	19:40096
9	*See* LA-UR-85-2362	E 1.99: DE85015674	MN -37	19:40091
CONF-850761-	(1. annual tar sand/oil shale contractors' meeting, Morgantown, WV, USA, 9-11 Jul 1985)			
4	*See* SAND-85-1372C	E 1.99: DE85013952	MN -91	19:38816
5	*See* LA-UR-85-2273	E 1.99: DE85014071	MN -91	19:38818
CONF-850762-	(8. meeting of international collaboration on advanced neutron sources, Oxford, UK, 7-12 Jul 1985)			
1	*See* LA-UR-85-2070	E 1.99: DE85014115	MN -37	19:40042
CONF-850764-	(International School of Physics on molecular dynamics simulation of statistical mechanical systems, Varenna, Lake Como, Italy, 23 Jul-3 Aug 1985)			
1	*See* LA-UR-85-2292	E 1.99: DE85014067	MN -34	19:41088
CONF-850765-	(26. annual meeting of the Institute of Nuclear Materials Management, Albuquerque, NM, USA, 21-24 Jul 1985)			
3	*See* RFF-3850	E 1.99: DE85014769	MN -15	19:38964
5	*See* SAND-85-1570C	E 1.99: DE85014841	MN -15	19:38969
6	*See* SAND-85-0767C	E 1.99: TI85015168	MN -15	19:38967
7	*See* SAND-85-1224C	E 1.99: DE85015145	MN -15	19:38968
8	*See* SAND-85-1576C	E 1.99: DE85014837	MN -15	19:38970
9	*See* SAND-85-1670C	E 1.99: DE85015160	MN -15	19:38971
10	*See* SAND-85-0381C	E 1.99: DE85015161	MN -15	19:38966
11	*See* DOE/SR-3	E 1.99: DE85014936	MN -15	19:38954
CONF-850767-	(15. international symposium on shock waves and shock tubes, Berkeley, CA, USA, 29 Jul-2 Aug 1985)			
1	*See* UCRL-91625	E 1.99: DE85014805	MN -35	19:40110
CONF-850807-	(6. international symposium on polarization phenomena in nuclear physics, Osaka, Japan, 26-30 Aug 1985)			
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85013873	MN -34C	19:40679
3	*See* LA-UR-85-2047	E 1.99: DE85014119	MN -34C	19:40674
4	*See* LBL-19795	E 1.99: DE85015253	MN -34C	19:40675
CONF-850808-	(20. intersociety energy conversion engineering conference, Miami Beach, FL, USA, 18-23 Aug 1985)			
6	*See* LA-UR-85-1870	E 1.99: DE85012763	MN -80	19:39157
CONF-850809-	(8. international conference on structural mechanics in reactor technology, Brussels, Belgium, 19-23 Aug 1985)			
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85003045	MN -79e	19:39249
5	*See* SAND-84-1427C	TI85006763	MN -78	19:39366
7	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85006842	MN -79	19:39146
12	*See* UCRL-91242	E 1.99: DE85007264	MN -80	19:39565
26	*See* UCRL-92125	E 1.99: DE85008295	MN -78	19:39367
40	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85009709	MN -79	19:39250
42	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85009717	MN -80	19:39251
49	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85010288	MN -80	19:39608
53	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85010511	MN -80	19:39252
54	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85010523	MN -79p	19:39253
59	*See* LA-UR-85-1284	E 1.99: DE85010705	MN -80	19:39616
61	*See* BNL-NUREG-36342	TI85011827	MN -78	19:39243
67	*See* BNL-NUREG-36337	TI85012507	MN -80	19:39242
70	*See* BNL-NUREG-36473	TI85014211	MN -80	19:39245
71	*See* BNL-NUREG-36470	TI85014187	MN -80	19:39244

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CONF-850810-	(National heat transfer conference, Denver, CO, USA, 4-7 Aug 1985)				
7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85006840	MN -78	19:39254
10	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85007897	MN -78	19:39255
13	*See* BNL-NUREG-35944		TI85008293	MN -78	19:39241
21	*See* LBL-19084	E 1.99:	DE85014534	MN -38	19:39757
CONF-850836-	(American Institute of Chemical Engineers national meeting, Seattle, WA, USA, 25-28 Aug 1985)				
1	*See* EGG-M-13985		TI85014596	MN -80	19:39290
CONF-850880-	(6. international meeting on ferroelectricity, Kobe, Japan, 12-16 Aug 1985)				
1	*See* BNL-36634	E 1.99:	DE85013309	MN -25	19:39604
2	*See* SAND-85-0435C	E 1.99:	DE85015489	MN -25	19:39624
CONF-850885-	(1. annual AFCEA symposium and exposition on physical and electronic security, Philadelphia, PA, USA, 19-21 Aug 1985)				
2	*See* LA-UR-85-1933	E 1.99:	DE85014134	MN -15	19:38962
3	*See* SAND-85-1487C	E 1.99:	DE85013788	MN -37	19:39783
CONF-850887-	(SPIE international technical symposium on optical and electro-optical engineers, San Diego, CA, USA, 18-23 Aug 1985)				
1	*See* SAND-85-1046C	E 1.99:	DE85013948	MN -32	19:41090
4	*See* LA-UR-85-2265	E 1.99:	DE85014074	MN -37	19:40059
8	*See* UCRL-92160	E 1.99:	DE85015188	MN -21	19:40990
10	*See* UCRL-92170	E 1.99:	DE85015177	MN -37	19:39746
12	*See* SAND-85-0356C		DE85015507	MN -37	19:40094
CONF-850889-	(International conference on metallurgical applications of shock wave and high-strain rate phenomena, Portland, OR, USA, 28 Jul-2 Aug 1985)				
3	*See* SAND-85-0233C	E 1.99:	DE85015163	MN -25	19:39558
4	*See* SAND-85-0405C	E 1.99:	DE85015150	MN -25	19:39592
CONF-850890-	(International conference on magnetism, San Francisco, CA, USA, 26-30 Aug 1985)				
1	*See* LA-UR-85-2106	E 1.99:	DE85014104	MN -34A	19:40460
7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014991	MN -25	19:39586
10	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015323	MN -25	19:39489
CONF-850893-	(Practical applications of ground water models conference, Columbus, OH, USA, 19-21 Aug 1985)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014987	MN -11	19:40155
CONF-850897-	(Mechanical properties and behaviour of solids, Trieste, Italy, 12-30 Aug 1985)				
1	*See* DOE/ER/45098-8	E 1.99:	DE85015596	MN -25	19:39496
CONF-850901-	(2. European conference on coal liquid mixtures, London, UK, 17-19 Sep 1985)				
1	*See* BNL-36514	E 1.99:	DE85014828	MN -90a	19:38739
CONF-850902-	(2. international symposium on environmental degradation of materials in nuclear power systems--water reactors, Monterey, CA, USA, 9-12 Sep 1985)				
2	NTIS, PC A02/MF A01 - GPO		TI85014964	MN -78	19:39110
CONF-850903-	(International topical meeting on computer applications for nuclear power plant operation and control, Pasco, WA, USA, 8-12 Sep 1985)				
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85007986	MN -78	19:39147
4	*See* UNI-SA-144	E 1.99:	DE85008436	MN -80	19:39237
5	*See* HEDL-SA-3283-FP	E 1.99:	DE85008496	MN -79g	19:39221
7	*See* HEDL-SA-3274-S	E 1.99:	DE85013997	MN -79	19:39220
CONF-850913-	(WATERPOWER '85 - international conference on hydropower, Las Vegas, NV, USA, 25-27 Sep 1985)				
1	*See* TVA/PE/OE-85/28		DE85901870	MN -97e	19:38991
CONF-850917-	(Topical meeting on criticality safety and the storage of fissile material, Jackson, WY, USA, 9-12 Sep 1985)				
3	*See* UNI-SA-150	E 1.99:	DE85012037	MN -85	19:38860
CONF-850918-	(International topical meeting on high level nuclear waste disposal - technology and engineering, Pasco, WA, USA, 24-26 Sep 1985)				
3	*See* SAND-85-0024C		TI85014642	MN -70	19:38929
CONF-850926-	(ASME vibration and sound conference, Cincinnati, OH, USA, 10-13 Sep 1985)				
3	*See* UNI-SA-143	E 1.99:	DE85011701	MN -80	19:39236
4	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85005507	MN -22	19:38834
CONF-850938-	(2. conference on the mechanical behavior of salt, Hannover, F.R. Germany, 24-29 Sep 1985)				
1	*See* SAND-84-0804C	E 1.99:	DE85006106	MN -70	19:38926
CONF-850941-	(European offshore conference, Aberdeen, UK, 10-13 Sep 1985)				
1	*See* SAND-85-0076C	E 1.99:	DE85006740	MN -92a	19:38789
CONF-850942-	(190. American Chemical Society national meeting, Chicago, IL, USA, 8-13 Sep 1985)				
2	*See* SAND-85-0254C	E 1.99:	DE85008407	MN -90d	19:38706
3	*See* SAND-85-0305C	E 1.99:	DE85008418	MN -90d	19:38707
4	*See* DOE/FE/60181-129	E 1.99:	DE85009611	MN -90c	19:38680
5	*See* DOE/FE/60181-131	E 1.99:	DE85009857	MN -90d	19:38681
8	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85010269	MN -90a	19:38711
12	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85010649	MN -90d	19:38666

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13	*See* SAND-85-0198C	E 1.99: DE85011188	MN -90d	19:38705
17	*See* UCRL-92192	E 1.99: DE85013977	MN -91	19:38817
CONF-850943-	(5. international conference on heavy metals in the environment, Athens, Greece, 10-13 Sep 1985)			
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85013987	MN -11	19:40156
2	*See* LA-UR-85-2175	E 1.99: DE85014094	MN -48	19:40206
CONF-850946-	(International conference on mechanical and physical behaviour of materials under dynamic loading, Paris, France, 2-5 Sep 1985)			
2	*See* UCRL-90817	E 1.99: DE85009582	MN -25	19:39564
3	*See* LA-UR-85-1135	E 1.99: DE85010779	MN -25	19:39549
CONF-850960-	(International conference on new frontiers for hazardous waste management, Pittsburgh, PA, USA, 15-18 Sep 1985)			
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85013990	MN -70B	19:38873
CONF-850976-	(9. international symposium on military applications of blast simulation, Oxford, UK, 23-27 Sep 1985)			
2	*See* LA-UR-85-1525	E 1.99: DE85012694	MN -48	19:40235
CONF-850996-	(29. Human Factors Society annual meeting, Baltimore, MD, USA, 30 Sep-4 Oct 1985)			
1	*See* SAND-85-0191C	E 1.99: DE85013755	MN -15	19:38965
CONF-850997-	(International symposium on mining technology and science, Xuzhou, China, 18-20 Sep 1985)			
1	*See* LA-UR-85-1637	E 1.99: DE85012649	MN -88	19:38734
CONF-8509102-	(International conference on magnetism, San Francisco, CA, USA, 26-30 Sep 1985)			
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85013989	MN -25	19:39493
CONF-8509112-	(International conference on physical basis and modelling of finite deformation of aggregates, Paris, France, 30 Sep-2 Oct 1985)			
1	*See* LA-UR-85-2221	E 1.99: DE85014081	MN -25	19:39474
CONF-8509117-	(Annual technical conference and exposition of the Society of Petroleum Engineers, Las Vegas, NV, USA, 22-25 Sep 1985)			
1	*See* SAND-85-1439C	E 1.99: DE85015167	MN -66c	19:39049
CONF-8509119-	(2. Society of Mining Engineers U.S. mine ventilation symposium, Reno, NV, USA, 23-25 Sep 1985)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85013889	MN -70	19:38874
CONF-8509125-	(Conference on separation of ionic solutes, Smolenice, Czecholovakia, 2-6 Sep 1985)			
1	*See* RFP-3857	E 1.99: DE85015256	MN -10	19:39679
CONF-851007-	(3. international meeting on reactor thermal hydraulics, Newport, RI, USA, 15-18 Oct 1985)			
9	*See* EGG-M-08385	E 1.99: DE85014575	MN -78	19:39288
CONF-851115-	(American Nuclear Society winter meeting, San Francisco, CA, USA, 10-15 Nov 1985)			
2	*See* LA-UR-85-2192	E 1.99: DE85014090	MN -38	19:39861
4	*See* LA-UR-85-2193	E 1.99: DE85014089	MN -79	19:39729
9	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014652	MN -78	19:39115
COO-				
3130TC-25	*See* DOE/ER/03130-25	E 1.99: DE85014448	MN -34D	19:40503
3382-17	*See* DOE/EV/03382-17	E 1.99: DE85011808	MN -48	19:40267
3382-23	*See* DOE/EV/03382-23	E 1.99: DE85015288	MN -48	19:40275
COVENIN-				
2026-83	NTIS (US Sales Only), PC A03/MF A01	DE85701684	MN -2	19:38846
CRN-HE-				
84-10	NTIS (US Sales Only), PC A02/MF A01	DE85751926	MN -34D	19:40558
CRN-PN-				
84-10	NTIS (US Sales Only), PC A04/MF A01	DE85751938	MN -34C	19:40647
84-28	NTIS (US Sales Only), PC A07/MF A01	DE85751939	MN -34C	19:40728
CRS-WP-				
24	NTIS (US Sales Only), PC A05/MF A01	DE85701683	MN -2	19:38953
27	NTIS (US Sales Only), PC A03/MF A01	DE85701681	MN -2	19:38861
CSNI-				
95	*See* KFK-3800		ND -80	19:39344
CTA-IEAV-NT-				
04/ 84	NTIS (US Sales Only), PC A02/MF A01	DE85701691	MN -34D	19:40440
027/ 83	NTIS (US Sales Only), PC A02/MF A01	DE85701690	MN -34D	19:41079
028/ 83	NTIS (US Sales Only), PC A02/MF A01	DE85701708	MN -34A	19:40441
CTA-IEAV-RP-				
010/ 83	NTIS (US Sales Only), PC A02/MF A01	DE85701694	MN -34D	19:40609
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49097	Canadian Theses on Microfiche Service, National Library of Canada, Ottawa, Canada K1A 0N4		ND -34D	19:40933
D-				
180-28285-1	*See* AD-A-152801/7/XAB			19:38792
DDTF-				
52	*See* AERE-G-3159	DE85701876	MN -41	19:38867
DESY-				
84-123	NTIS (US Sales Only), PC A06/MF A01	DE85752006	MN -34D	19:40610
85-006	NTIS (US Sales Only), PC A03/MF A01	DE85752007	MN -34D	19:40559
85-008	NTIS (US Sales Only), PC A02/MF A01	DE85752009	MN -34D	19:40560
85-009	NTIS (US Sales Only), PC A02/MF A01	DE85752010	MN -34D	19:40611
85-010	NTIS (US Sales Only), PC A02/MF A01	DE85752018	MN -34D	19:40612

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85-012	NTIS (US Sales Only), PC A02/MF A01		DE85752017	MN -34D	19:40502
85-013	NTIS (US Sales Only), PC A04/MF A01		DE85752014	MN -34D	19:40613
85-015	NTIS (US Sales Only), PC A04/MF A01		DE85752015	MN -34D	19:40561
DFVLR-FB-					
84-43	NTIS (US Sales Only), PC A03/MF A01		DE85752200	MN -95	19:39752
DOE/AL/18797-					
T2	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85014386	MN -70A	19:38875
DOE/AL/27864-					
T2	NTIS MF A01; 2 (GPO Dep.)	E 1.99:	DE85012404	MN -71	19:38862
DOE/BC/10345-					
6	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE85000139	STD -92a	19:38787
DOE/BP-					
468	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014184	MN -11	19:39381
469	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014183	MN -11	19:39382
470	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99:	DE85014186	MN -11	19:39383
471	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE85014185	MN -11	19:39384
DOE/CE/15216-					
T1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014696	MN -92a	19:38788
DOE/CE/26405-					
T1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015222	MN -05	19:39467
DOE/CE/40561-					
T1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014939	MN -95f	19:39376
DOE/CE/40664-					
T17	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014682	MN -95f	19:38797
DOE/CH-					
2	NTIS, PC A10/MF A01 (GPO Dep.)	E 1.99:	DE85015554	MN -70	19:38876
DOE/CH/10195-					
1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015377	MN -11	19:40157
DOE/CS/69097-					
T1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015761	MN -95d	19:39436
T3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015916	MN -95	19:39429
DOE/DP/40124-					
65	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85014410	MN -21	19:41028
DOE/EI/19656-					
2	NTIS, PC A08/MF A01; 1 - GPO (GPO Dep.)	E 1.99:	DE85016246	MN -98	19:39402
DOE/EIA-					
0035(85/ 04)	NTIS, PC A07/MF A01 - GPO (GPO Dep.)	E 1.99:	DE85015831	MN -98	19:39414
0095(84)	NTIS, PC A05/MF A01 - GPO (GPO Dep.)	E 1.99:	DE85015557	MN -98E	19:39066
0109(85/ 05)	NTIS, PC A06/MF A01 - GPO (GPO Dep.)	E 1.99:	DE85015556	MN -98B	19:38794
0226(85/ 04)	NTIS, PC A03/MF A01; 1 - GPO (GPO Dep.)	E 1.99:	DE85014944	MN -98E	19:39405
0246(83)	NTIS, PC A09/MF A01; 1 - GPO (GPO Dep.)	E 1.99:	DE85015590	MN -98	19:39415
0249(85/ 1)	NTIS, PC A03/MF A01 - GPO (GPO Dep.)	E 1.99:	DE85015553	MN -98	19:41069
DOE/ER-					
0219	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015037	MN -11	19:40183
0225	NTIS, PC A11/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015510	MN -41	19:40265
0226	NTIS, PC A07/MF A01 (GPO Dep.)	E 1.99:	DE85015286	MN -11	19:40158
0227	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99:	DE85015285	MN -11	19:40159
0228	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015283	MN -11	19:40160
DOE/ER/02504-					
T3	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014511	MN -28	19:40496
DOE/ER/03130-					
25	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE85014448	MN -34D	19:40503
259	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014447	MN -34D	19:40504
371	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014446	MN -34D	19:40614
DOE/ER/03244-					
110	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014325	MN -34D	19:40505
111	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014326	MN -34D	19:40506
113	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014328	MN -34D	19:40507
114	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014329	MN -34D	19:40508
DOE/ER/03992-					
569	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85007031	MN -34D	19:40952
576	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014731	MN -34D	19:40562
577	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014730	MN -34D	19:40563
DOE/ER/04999-					
T3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85013511	MN -34D	19:40564
T4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013512	MN -34D	19:40565
DOE/ER/05172-					
0019	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014729	MN -34C	19:40712
DOE/ER/05940-					
T1	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE85014878	MN -28	19:39835
DOE/ER/06027-					
15	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE85015282	MN -34A	19:40442
DOE/ER/10107-					
28	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014506	MN -20c	19:39494
DOE/ER/10372-					
T1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015499	MN -4	19:39709
DOE/ER/10495-					
5	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85012463	MN -34C	19:40729
DOE/ER/10836-					
T1	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99:	DE85005486	STD -63c	19:38999
DOE/ER/10864-					
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014843	MN -34	19:40917
DOE/ER/10901-					
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015376	MN -48	19:40203

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
DOE/ER/10944-4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015374	MN -48	19:40204
DOE/ER/10954-3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014732	MN -32	19:41080
DOE/ER/13163-7	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015011	MN -38	19:39761
DOE/ER/40025-34	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014899	MN -34D	19:40566
35	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014900	MN -34D	19:39891
36	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85014901	MN -34D	19:40509
DOE/ER/40033-78	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85013596	MN -34D	19:40510
DOE/ER/40043-T1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014206	MN -28	19:39806
DOE/ER/40169-1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014271	MN -34D	19:40567
DOE/ER/45025-7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014444	MN -25	19:39495
DOE/ER/45098-8	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015596	MN -25	19:39496
DOE/ER/45133-1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015289	MN -25	19:39473
DOE/ER/45184-1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015559	MN -25	19:39497
DOE/ER/53105-T2	NTIS, PC A05; 3		DE85014720	MN -20b	19:40960
DOE/ER/53179-T4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014136	MN -34C	19:40670
DOE/ER/60166-1	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015208	MN -48	19:40306
DOE/ER/60179-2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015962	MN -11	19:40161
DOE/ER/60257-1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015575	MN -48	19:40307
DOE/ET-53088-194	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014767	MN -20g	19:40961
DOE/ET/10393-1855	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99:	DE85008604	STD -90e	19:38758
DOE/ET/11292-1893-Vol.1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85009358	STD -93A	19:39421
1893-Vol.2	NTIS, PC A10/MF A01 (GPO Dep.)	E 1.99:	DE85009359	STD -93A	19:39422
1893-Vol.3	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99:	DE85009360	STD -93A	19:39423
1893-Vol.4	NTIS, PC A15/MF A01; 1 (GPO Dep.)	E 1.99:	DE85009361	STD -93A	19:39424
DOE/ET/13031-T4-Vol.1	NTIS, PC A16/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015324	MN -89	19:38667
T4-Vol.2-Bk.1	NTIS, PC A17/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015325	MN -89	19:38710
T4-Vol.2-Bk.2	NTIS, PC A12/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015334	MN -89	19:38709
T4-Vol.3	NTIS, PC A11/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015335	MN -89	19:38668
T4-Vol.4	NTIS, PC A19/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015336	MN -89	19:38669
T4-Vol.5	NTIS, PC A11/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015337	MN -89	19:38670
T5	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015326	MN -89	19:38671
T6	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015327	MN -89	19:38672
T7	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015328	MN -89	19:38673
T8	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015329	MN -89	19:38674
T9	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015332	MN -89	19:38675
T10	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015330	MN -89	19:38676
T11	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015333	MN -89	19:38677
T12	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015331	MN -89	19:38678
DOE/ET/13410-T5	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015967	MN -90e	19:38759
DOE/ET/29101-1	NTIS, PC A08/MF A01 (GPO Dep.)	E 1.99:	DE85015381	MN -97	19:39067
DOE/ET/34019-5	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015421	STD -78	19:39116
DOE/ET/51013-140	NTIS, PC A17/MF A01 (GPO Dep.)	E 1.99:	DE85013650	MN -20	19:40962
148	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015579	MN -20	19:40963
DOE/ET/53051-83	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014862	STD -20f	19:41029
DOE/ET/53088-188	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014764	MN -20f	19:40964
DOE/EV/03140-T4	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015111	MN -48	19:40308
DOE/EV/03380-40	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015963	MN -48	19:40266
DOE/EV/03382-17	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE85011808	MN -48	19:40267
23	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015288	MN -48	19:40275
DOE/EV/03728-18	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85016110	MN -48	19:40210
DOE/EV/04625-T4	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015578	MN -48	19:40216
DOE/EV/10429-T2	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014054	MN -11	19:40123

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DOE/FE/60177-				
1881	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE85009913	STD -91	19:38809
1897	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015755	STD -91	19:38815
DOE/FE/60181-				
129	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85009611	MN -90c	19:38680
131	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85009857	MN -90d	19:38681
DOE/FE/60194-				
T1	NTIS, PC A12/MF A01; 1 (GPO Dep.)	E 1.99: DE85014954	MN -91	19:38813
DOE/FE/60338-				
14	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE85015500	MN -93A	19:39425
DOE/ID/01745-				
T6	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015546	MN -90g	19:39418
DOE/IE/10372-				
T1	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE85014875	MN -98E	19:39406
DOE/IR/06466-				
T1	NTIS, PC A13/MF A01; 1 (GPO Dep.)	E 1.99: DE85015223	MN -95d	19:39437
DOE/IR/10103-				
T1	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE85014888	MN -90	19:38977
DOE/JPL-				
1012-95	NTIS, PC A99/MF A01; 1 (GPO Dep.)	E 1.99: DE84014619	STD -63b	19:39000
DOE/MA-				
0138/ 5	NTIS, PC A99/MF A01; 1 (GPO Dep.)	E 1.99: DE85014881	MN -13	19:41059
DOE/MC/21153-				
1870	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE85013604	STD -92a	19:38803
DOE/METC-				
85/ 4001	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85003351	MN -91	19:38814
85/ 6014	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99: DE85003360	STD -92a	19:38786
DOE/MI/10028-				
T2-App.	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99: DE85013107	MN -13	19:41060
DOE/NBM-				
5014898	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE85014898	MN -11	19:38727
5015226	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015226	MN -95	19:39430
5015230	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015230	MN -95	19:39431
5015973	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015973	MN -11	19:38992
DOE/NE/44153-				
T1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015089	MN -70	19:38877
DOE/NV/10327-				
13	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99: DE85015608	MN -70B	19:38878
19	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99: DE85015611	MN -41	19:40136
DOE/OR/00033-				
T98	NTIS, PC A10/MF A01 (GPO Dep.)	E 1.99: DE85015024	MN -11	19:40128
T99	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99: DE85015012	MN -90b	19:38741
T102	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99: DE85015015	MN -51	19:38826
T103	NTIS, PC A06/MF A01 (GPO Dep.)	E 1.99: DE85015018	MN -48	19:40205
T104	NTIS, PC A08/MF A01 (GPO Dep.)	E 1.99: DE85015013	MN -34C	19:40713
T105	NTIS, PC A06/MF A01 (GPO Dep.)	E 1.99: DE85015016	MN -34A	19:40443
T107	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99: DE85015025	MN -11	19:40137
T152	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99: DE85015023	MN -11	19:40152
T153	NTIS, PC A06/MF A01 (GPO Dep.)	E 1.99: DE85015019	MN -48	19:40276
DOE/OR/21400-				
T157	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015972	MN -11	19:40162
DOE/PC/10339-				
T1	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99: DE85014946	MN -90d	19:38742
T2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014950	MN -90d	19:38746
DOE/PC/30236-				
T3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015775	MN -90d	19:38682
DOE/PC/30264-				
3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015776	MN -90d	19:38683
DOE/PC/40268-				
8-Pt.1	NTIS, PC A11/MF A01; 1 (GPO Dep.)	E 1.99: DE85014561	STD -90b	19:38760
8-Pt.2	NTIS, PC A12/MF A01; 1 (GPO Dep.)	E 1.99: DE85014562	STD -90b	19:38761
DOE/PC/50030-				
T11	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015264	MN -90d	19:38684
DOE/PC/50033-				
T5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85013012	MN -90d	19:38685
DOE/PC/50270-				
T11	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015550	MN -90b	19:38747
DOE/PC/50793-				
T11	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE85014421	MN -90d	19:38686
DOE/PC/51504-				
9	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99: DE85015574	STD -90e	19:38762
DOE/PC/60015-				
27	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85015105	MN -90d	19:38712
DOE/PC/60019-				
4	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015200	STD -90d	19:38978
5	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99: DE85015201	STD -90d	19:38979
6	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE85015199	STD -90d	19:38980
DOE/PC/60020-				
T1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015124	MN -90d	19:38687
T2	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015125	MN -90d	19:38688
T3	NTIS, PC A07/MF A01 (GPO Dep.)	E 1.99: DE85015122	MN -90d	19:38689
T4	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015123	MN -90d	19:38690
DOE/PC/60044-				
T6	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99: DE85014430	MN -90d	19:38691

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DOE/PC/60054-T7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015104	MN -90d	19:38692
DOE/PC/60775-16	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99: DE85015008	STD -90b	19:38693
DOE/PC/60787-7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014721	MN -90d	19:38694
DOE/PC/60797-7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014160	MN -90d	19:38695
DOE/PC/60798-7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014937	MN -90a	19:38696
DOE/PC/60803-T5	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015108	MN -90d	19:38714
DOE/PC/60804-T7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014042	MN -90d	19:39693
DOE/PC/60805-T7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014770	MN -90a	19:38981
DOE/PC/60806-T3	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85012998	MN -90b	19:38748
DOE/PC/70057-T3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015120	MN -90a	19:38749
DOE/PC/70061-4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014422	MN -90b	19:38715
DOE/PC/70507-3	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE85014745	STD -90g	19:39419
DOE/PC/70764-2	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE85015121	MN -90a	19:38763
DOE/PC/70765-5	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99: DE85015351	MN -90b	19:38750
DOE/PC/70771-T1	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE85014943	MN -90e	19:39100
DOE/PC/70773-2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85014438	MN -90a	19:38717
DOE/PC/70793-T3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85013947	MN -90a	19:38718
DOE/PC/70795-T3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014457	MN -90a	19:38697
DOE/PC/70801-T4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014153	MN -90d	19:38698
DOE/PC/70809-T2	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85014722	MN -90	19:38719
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DOE/PC/72268-5	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99: DE85015592	MN -90	19:38732
DOE/R2/05121-T1	NTIS MF A01; 2 (GPO Dep.)	E 1.99: DE85015649	MN -95f	19:39461
DOE/R2/05292-T1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015615	MN -61E	19:38982
DOE/R2/05322-T1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015630	MN -95d	19:39438
DOE/R8/05031-T1	NTIS, PC A11/MF A01; 1 (GPO Dep.)	E 1.99: DE85013397	MN -95e	19:38989
DOE/RG/10192-T1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015221	MN -98E	19:39407
DOE/S-0004/ 1	NTIS, PC A09/MF A01 (GPO Dep.)	E 1.99: DE85015535	MN -13	19:41070
0034	NTIS, PC A12/MF A01; 1 (GPO Dep.)	E 1.99: DE85015420	STD -90	19:38768
0036-Vol.1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85014760	MN -90	19:38751
DOE/SR-3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85014936	MN -15	19:38954
DOE/SR-WM-85-1	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99: DE85014959	MN -70	19:38879
DPST-85-133-1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85014940	MN -23	19:38976
DREO-903	*See* AD-A-152339/8/XAB			19:39886
E-1988	*See* N-85-21162			19:39710
ECRC/M-1798	*See* PB-85-184877/XAB			19:39449
1843	*See* PB-85-189793/XAB			19:39619
1904	*See* PB-85-185965/XAB			19:39450
ECRC/R-1803	*See* PB-85-185619/XAB			19:39463
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EFI-611(1) -83	NTIS (US Sales Only), PC A02/MF A01	DE85781299	MN -37	19:39892
614(4) -83	NTIS (US Sales Only), PC A02/MF A01	DE85701724	MN -34D	19:40615
615(5) -83	NTIS (US Sales Only), PC A02/MF A01	DE85701790	MN -34D	19:40511
616(6) -83	NTIS (US Sales Only), PC A02/MF A01	DE85781336	MN -37	19:39893
620(10) -83	NTIS (US Sales Only), PC A02/MF A01	DE85781300	MN -37	19:39894
621(11) -83	NTIS (US Sales Only), PC A02/MF A01	DE85701749	MN -34A	19:40865

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624(14) -83	NTIS (US Sales Only), PC A02/MF A01	DE85701791	MN -34D	19:40512
641(31) -83	NTIS (US Sales Only), PC A02/MF A01	DE85701725	MN -34D	19:40616
642(32) -83	NTIS (US Sales Only), PC A02/MF A01	DE85701736	MN -34D	19:40617
643(33) -83	NTIS (US Sales Only), PC A02/MF A01	DE85701792	MN -34D	19:40513
669(39) -83	NTIS (US Sales Only), PC A02/MF A01	DE85701750	MN -34A	19:40866
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2403	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015534	STD -78	19:39256
10282-1071	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015238	STD -41	19:40168
EGG-EA-				
6861	NTIS, PC A02/MF A01 - GPO	TI85014636	MN -78	19:39257
EGG/LTR-				
10-25	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015427	MN -78	19:39258
10-34	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015426	MN -78	19:39259
20-101	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE85015873	MN -78	19:39212
111-90	NTIS, PC A02; 3	DE85015466	MN -78	19:39260
111-100	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85015439	MN -78	19:39261
111-102	NTIS, PC A19; 3	DE85015429	MN -78	19:39262
112-88-Suppl.1	NTIS, PC A05; 3	DE85015459	MN -78	19:39263
112-121	NTIS, PC A03; 3	DE85015450	MN -78	19:39264
112-132	NTIS, PC A03; 3	DE85015453	MN -78	19:39265
112-133	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015452	MN -78	19:39266
112-141	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015451	MN -78	19:39213
113-53	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85015442	MN -78	19:39267
114-96	NTIS, PC A04; 3	DE85015441	MN -78	19:39214
114-97	NTIS, PC A04; 3	DE85015443	MN -78	19:39268
115-13-Suppl.A	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015425	MN -78	19:39269
115-30-App.I	NTIS MF A01; 2 (GPO Dep.)	E 1.99: DE85015445	MN -78	19:39215
115-31-App.H	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015444	MN -78	19:39270
115-33	NTIS, PC A02; 3	DE85015448	MN -78	19:39271
115-39	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85015447	MN -78	19:39272
121-3	NTIS, PC A02; 3	DE85015430	MN -78	19:39216
121-4	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015460	MN -78	19:39273
123-7	NTIS, PC A04; 3	DE85015446	MN -78	19:39274
129-11-Suppl.1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015434	MN -78	19:39275
132-1	NTIS, PC A05; 3	DE85015431	MN -78	19:39276
141-62-Suppl.1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015435	MN -78	19:39277
1115-43	NTIS, PC A03; 3	DE85015440	MN -78	19:39278
1118-9	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015455	MN -78	19:39279
1141-30	NTIS, PC A07; 3	DE85015471	MN -78	19:39280
1141-33	NTIS MF A01; 2 (GPO Dep.)	E 1.99: DE85015472	MN -78	19:39281
1144-26	NTIS, PC A11; 3	DE85015454	MN -78	19:39282
1217-2	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE85015456	MN -78	19:39217
1217-4	NTIS, PC A04; 3	DE85015457	MN -78	19:39283
1310-20	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015476	MN -78	19:39284
1310-33	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015464	MN -78	19:39218
1326-1	NTIS, PC A03; 3	DE85015438	MN -78	19:39219
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01285	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014629	MN -33A	19:41081
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05481	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85012427	MN -78	19:39287
06885	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014627	MN -70B	19:38880
07685	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85014632	MN -32	19:41082
08385	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85014576	MN -78	19:39288
08685	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85009830	MN -38	19:39718
10385	NTIS, PC A02/MF A01 - GPO	TI85014571	MN -78	19:39289
12685	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014567	MN -34C	19:40778
13484	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014634	MN -80	19:39156
13985	NTIS, PC A02/MF A01	TI85014596	MN -80	19:39290
16385	NTIS, PC A02/MF A01 - GPO (GPO Dep.)	E 1.99: TI85014631	MN -78	19:39498
17884	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014623	MN -38	19:39762
21484	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014619	MN -70	19:38881
EHD-				
83-89	NTIS (US Sales Only), PC A03/MF A01	DE85701639	MN -41	19:40889
83-90	NTIS (US Sales Only), PC A04/MF A01	DE85701640	MN -41	19:40890
83-91	NTIS (US Sales Only), PC A04/MF A01	DE85701641	MN -41	19:40891
83-100	NTIS (US Sales Only), PC A04/MF A01	DE85701630	MN -48	19:40217
83-102	NTIS (US Sales Only), PC A03/MF A01	DE85701637	MN -41	19:40892
83-104	NTIS (US Sales Only), PC A05/MF A01	DE85701638	MN -41	19:40277
EPA-				
600/ 9-81-028a	*See* PB-81-236119	TI85901488	MN -90i	19:38724
EPRI-AP-				
3662-Vol.1	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920765	ND -90d	19:38703
EPRI-CS-				
3862-Vol.2	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920754	ND -90i	19:38722
4071	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920755	ND -90b	19:38752
4073-Vol.2	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920756	ND -12	19:39096
4084-Vol.1	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920701	ND -90b	19:38753

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4087	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920759	ND -90i	19:38723
4094	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920761	ND -97	19:40323
EPRI-EA-				
3619-Vol.3	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920751	ND -97	19:39097
3619-Vol.4	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920752	ND -97	19:38847
4020	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920753	ND -41	19:40201
4088	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920715	ND -97b	19:39408
4120	Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303	TI85920712	ND -97	19:39104
EPRI-EL-				
3973	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920762	ND -97a	19:39105
4147-Vol.1	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920763	ND -97a	19:39106
4150	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920764	ND -97a	19:39107
EPRI-EM-				
4123	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920733	ND -97d	19:39426
4125	NTIS, PC A10/MF A01; 1 - Research Reports Center, Box 50490, Palo Alto, CA 94303 (GPO Dep.)	E 1.99: DE85015293	MN -95d	19:39439
4129	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920734	ND -97d	19:39427
4130	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920735	ND -38	19:39499
4132	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920737	ND -38	19:39500
4142	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920738	ND -95d	19:39440
4151	NTIS, PC A06/MF A01; 1 - Research Reports Center, Box 50490, Palo Alto, CA 94303 (GPO Dep.)	E 1.99: DE85015300	MN -94cb	19:39372
EPRI-NP-				
2709-CCM-Vol.4	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920724	ND -80	19:41083
3802-Vol.1	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920739	ND -78	19:39117
3802-Vol.2	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920740	ND -78	19:39291
3834-Vol.1	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920741	ND -80	19:39292
3834-Vol.2	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920742	ND -80	19:39293
3834-Vol.5	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920743	ND -80	19:39294
4078M	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920722	ND -78	19:39501
4091	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920744	ND -78	19:39300
4100	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920745	ND -78	19:39118
4119	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920746	ND -78	19:38848
4134	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920747	ND -78	19:39111
4139-SR	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920750	ND -78	19:39112
4146-SR	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI85920749	ND -78	19:39301
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83-1	NTIS (US Sales Only), PC A07/MF A01	DE85701631	MN -48	19:38939
EUR-				
8748	NTIS (US Sales Only), PC A15/MF A01	DE85701670	MN -70	19:38882
8749	NTIS (US Sales Only), PC A07/MF A01	DE85701671	MN -70	19:38883
8796	NTIS (US Sales Only), PC A13/MF A01	DE85701672	MN -70	19:38884
8797	NTIS (US Sales Only), PC A09/MF A01	DE85701673	MN -70	19:38885
8817	NTIS (US Sales Only), PC A05/MF A01	DE85701608	MN -25	19:39502
9115-Vol.1	NTIS (US Sales Only), PC A13/MF A01	DE85701674	MN -70	19:38886
9115-Vol.2	NTIS (US Sales Only), PC A10/MF A01	DE85701675	MN -70	19:38887
9167	NTIS (US Sales Only), PC A04/MF A01	DE85701651	MN -78	19:39302
9213	NTIS (US Sales Only), PC A04/MF A01	DE85701624	MN -34B	19:40138
9248	NTIS (US Sales Only), PC A03/MF A01	DE85701609	MN -25	19:39503
9258	NTIS (US Sales Only), PC A04/MF A01	DE85701676	MN -70	19:38888
9304	NTIS (US Sales Only), PC A04/MF A01	DE85701620	MN -51	19:38940
9306	NTIS (US Sales Only), PC A04/MF A01	DE85701677	MN -70	19:38889
9354-EN	*See* PB-85-186641/XAB			19:39364
9355	NTIS (US Sales Only), PC A11/MF A01	DE85701678	MN -70	19:38890
9381	NTIS (US Sales Only), PC A04/MF A01	DE85701679	MN -70	19:38891
9385	NTIS (US Sales Only), PC A09/MF A01	DE85701625	MN -34B	19:40139

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1232	NTIS (US Sales Only), PC A03/MF A01		DE85751933	MN -20d	19:41030
1241	NTIS (US Sales Only), PC A03/MF A01		DE85751995	MN -34	19:40953
1244	NTIS (US Sales Only), PC A03/MF A01		DE85751934	MN -20d	19:41031
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82003	NTIS (US Sales Only), PC A05/MF A01		DE85701659	MN -37	19:41032
82004	NTIS (US Sales Only), PC A02/MF A01		DE85701660	MN -37	19:41033
82005	NTIS (US Sales Only), PC A02/MF A01		DE85701682	MN -2	19:38972
82007	NTIS (US Sales Only), PC A04/MF A01		DE85701680	MN -2	19:39386
FAI-					
85/ 15	*See* PB-85-198489/XAB				19:39452
FE-					
2012-042	*See* DOE/ET/13031-T5	E 1.99:	DE85015326	MN -89	19:38671
2012-043	*See* DOE/ET/13031-T6	E 1.99:	DE85015327	MN -89	19:38672
2012-044	*See* DOE/ET/13031-T7	E 1.99:	DE85015328	MN -89	19:38673
2012-045	*See* DOE/ET/13031-T8	E 1.99:	DE85015329	MN -89	19:38674
2012-046	*See* DOE/ET/13031-T10	E 1.99:	DE85015330	MN -89	19:38676
2012-047	*See* DOE/ET/13031-T12	E 1.99:	DE85015331	MN -89	19:38678
2012-048	*See* DOE/ET/13031-T9	E 1.99:	DE85015332	MN -89	19:38675
2012-077-Vol.1	*See* DOE/ET/13031-T4-Vol.1	E 1.99:	DE85015324	MN -89	19:38667
2012-077-Vol.2-Bk.1	*See* DOE/ET/13031-T4-Vol.2-Bk.1	E 1.99:	DE85015325	MN -89	19:38710
2012-077-Vol.2-Bk.2	*See* DOE/ET/13031-T4-Vol.2-Bk.2	E 1.99:	DE85015334	MN -89	19:38709
2012-077-Vol.3	*See* DOE/ET/13031-T4-Vol.3	E 1.99:	DE85015335	MN -89	19:38668
2012-077-Vol.4	*See* DOE/ET/13031-T4-Vol.4	E 1.99:	DE85015336	MN -89	19:38669
2012-077-Vol.5	*See* DOE/ET/13031-T4-Vol.5	E 1.99:	DE85015337	MN -89	19:38670
2012/ Z/ 80/ 07	*See* DOE/ET/13031-T11	E 1.99:	DE85015333	MN -89	19:38677
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1437	NTIS (US Sales Only), PC A02/MF A01		DE85701766	MN -34A	19:39719
1454	NTIS (US Sales Only), PC A02/MF A01		DE85701909	MN -80	19:39172
1517	NTIS (US Sales Only), PC A02/MF A01		DE85701910	MN -80	19:39148
1541	NTIS (US Sales Only), PC A02/MF A01		DE85701893	MN -28	19:39836
FNAL/C-					
85/ 84	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014782	MN -34D	19:40514
85/ 86-A	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015385	MN -34B	19:40399
FRCEA-R-					
16	NTIS (US Sales Only), PC A05/MF A01		DE85751946	MN -70	19:38892
FRNC-TH-					
1920	NTIS (US Sales Only), PC A14/MF A01		DE85751937	MN -34C	19:40769
1998	NTIS (US Sales Only), PC A07/MF A01; 1		DE85752291	MN -59A	19:39462
2016	NTIS (US Sales Only), PC A06/MF A01		DE85752299	MN -61E	19:39466
FSRP-PSW-					
173	*See* PB-85-178796/XAB				19:40176
GA-A-					
17940	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014783	MN -20d	19:41034
GAO/NSIAD-					
85-37	US General Accounting Office, Box 6015, Gaithersburg, MD 20877		TI85901766	MN -13	19:39770
85-61	US General Accounting Office, Box 6015, Gaithersburg, MD 20877		TI85901767	MN -13	19:41061
85-62	US General Accounting Office, Box 6015, Gaithersburg, MD 20877		TI85901768	MN -13	19:41062
85-72	US General Accounting Office, PO Box 6015, Gaithersburg, MD 20877		TI85901771	MN -13	19:41063
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85-15	US General Accounting Office, Box 6015, Gaithersburg, MD 20877		TI85901773	MN -13	19:41095
85-73	US General Accounting Office, Box 6015, Gaithersburg, MD 20877		TI85901755	MN -11	19:40147
85-75	US General Accounting Office, Box 6015, Gaithersburg, MD 20877		TI85901754	MN -69	19:40174
85-113	US General Accounting Office, Box 6015, Gaithersburg, MD 20877		TI85901761	MN -92	19:38799
GEND-					
050	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015387	STD -78	19:39303
GEPP-TM-					
904	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014848	MN -38	19:39720
GKSS-					
84/ E/ 45	NTIS (US Sales Only), PC A02/MF A01		DE85752201	MN -11	19:40186
84/ E/ 49	NTIS (US Sales Only), PC A02/MF A01; 1		DE85752202	MN -11	19:40129
84/ E/ 50	NTIS (US Sales Only), PC A02/MF A01		DE85752203	MN -11	19:40130
GPO-					
34-227	*See* N-85-20143				19:39403
GRI-					
84/ 0187	NTIS, PC A09/MF A01		TI85901417	MN -92b	19:38802
GSCan-P-					
83-1A	NTIS (US Sales Only), PC A22/MF A01		DE85781277	MN -4	19:40328
83-1B	NTIS (US Sales Only), PC A20/MF A01		DE85781278	MN -4	19:40331
84-1B	NTIS (US Sales Only), PC A19/MF A01		DE85781279	MN -4	19:40389
GSF-A-					
6-84	NTIS (US Sales Only), PC A08/MF A01; 1		DE85752362	MN -48	19:40309

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
7/ 84-Ed.2	NTIS (US Sales Only), PC A12/MF A01		DE85752361	MN -41	19:40310
GSI-					
84-89-Prepr.	Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt, Germany, F.R.			ND -34C	19:40648
85-13-Prepr.	NTIS (US Sales Only), PC A02/MF A01		DE85752011	MN -34C	19:40730
85-14-Prepr.	NTIS (US Sales Only), PC A02/MF A01		DE85752012	MN -34C	19:40731
85-15-Prepr.	NTIS (US Sales Only), PC A02/MF A01		DE85752020	MN -34A	19:40444
HE-TP-					
27248	NTIS (US Sales Only), PC A05/MF A01		DE85701881	MN -71	19:38849
HEDL-SA-					
2179	NTIS, PC A02/MF A01		TI85015481	MN -78	19:39304
2262	NTIS, PC A02/MF A01 - GPO (GPO Dep.)	E 1.99:	TI85015347	MN -78	19:39305
3224-FP	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013736	MN -79p	19:39306
3234-FP	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013746	MN -79p	19:39307
3241-FP	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013744	MN -79	19:39308
3249-FP	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013734	MN -79p	19:39309
3253-FP	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013729	MN -83	19:39441
3274-S	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013997	MN -79	19:39220
3283-FP	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85008496	MN -79g	19:39221
HW-					
29635	NTIS, PC A02; 3		TI85014697	MN -71	19:38850
IAE-					
3739/ 2	NTIS (US Sales Only), PC A03/MF A01		DE85701786	MN -34D	19:40515
3775/ 6	NTIS (US Sales Only), PC A03/MF A01		DE85701757	MN -20	19:40966
3779/ 6	NTIS (US Sales Only), PC A03/MF A01		DE85701758	MN -20	19:40967
3786/ 2	NTIS (US Sales Only), PC A03/MF A01		DE85701810	MN -34C	19:40770
3788/ 16	NTIS (US Sales Only), PC A03/MF A01		DE85781319	MN -32	19:39895
3793/ 6	NTIS (US Sales Only), PC A02/MF A01		DE85701759	MN -20	19:40968
3795/ 11	NTIS (US Sales Only), PC A02/MF A01		DE85701613	MN -25	19:39504
3802/ 16	NTIS (US Sales Only), PC A02/MF A01		DE85701751	MN -34A	19:39505
3804/ 2	NTIS (US Sales Only), PC A02/MF A01		DE85781327	MN -37	19:39896
3818/ 11	NTIS (US Sales Only), PC A02/MF A01		DE85701614	MN -25	19:39506
3820/ 4	NTIS (US Sales Only), PC A03/MF A01		DE85701911	MN -78	19:39119
IAEA-CN-					
46/ 045	*See* AERE-MPD/NBS-261		DE85701744	MN -34A	19:39759
IAEA-HPRA-					
11	NTIS (US Sales Only), PC A08/MF A01		DE85701879	MN -41	19:40278
IAEA-R-					
2711-F	NTIS (US Sales Only), PC A03/MF A01		DE85701634	MN -23	19:40279
2790-F	NTIS (US Sales Only), PC A02/MF A01		DE85701635	MN -23	19:40280
2845-F	NTIS (US Sales Only), PC A03/MF A01		DE85701623	MN -11	19:40332
2886-F	NTIS (US Sales Only), PC A02/MF A01		DE85701603	MN -4	19:39701
3114-F	NTIS (US Sales Only), PC A02/MF A01		DE85781060	MN -34C	19:40705
3264-F	NTIS (US Sales Only), PC A02/MF A01		DE85701628	MN -48	19:40281
IAEA-SMR-					
93	NTIS (US Sales Only), PC A15/MF A01		DE85781405	MN -34C	19:39175
IAEA-TECDOC-					
306	NTIS (US Sales Only), PC A09/MF A01		DE85781282	MN -48	19:40166
321	NTIS (US Sales Only), PC A11/MF A01		DE85781407	MN -23	19:40893
IC-					
84/ 110	NTIS (US Sales Only), PC A02/MF A01		DE85701571	MN -34A	19:40867
84/ 122	NTIS (US Sales Only), PC A02/MF A01		DE85701616	MN -25	19:39507
84/ 130	NTIS (US Sales Only), PC A02/MF A01		DE85701611	MN -25	19:39508
84/ 142	NTIS (US Sales Only), PC A02/MF A01		DE85701612	MN -25	19:39509
ICRM-LSWG-					
1	*See* NPL-RS-51		DE85701873	MN -23	19:40226
ICTIS/RES-					
05	NTIS (US Sales Only), PC A08/MF A01		TI85901868	STD -90	19:38731
06	NTIS (US Sales Only), PC A09/MF A01		TI85901867	STD -90	19:38720
07	NTIS (US Sales Only), PC A06/MF A01		TI85901866	STD -90	19:38733
IDO-					
1570-T6	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015485	MN -78	19:39310
1570-T28	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015480	MN -78	19:39222
IEAL-					
336	*See* SAND-85-7153	E 1.99:	DE85015606	STD -71	19:38859
IERL-RTP-					
1083a	*See* PB-81-236119		TI85901488	MN -90i	19:38724
IFE/KR/E-					
83/ 005	NTIS (US Sales Only), PC A02/MF A01		DE85781072	MN -4	19:39702
84/ 008	NTIS (US Sales Only), PC A03/MF A01		DE85781038	MN -20	19:40485
84/ 009	NTIS (US Sales Only), PC A03/MF A01		DE85781088	MN -11	19:40194
IFSR-					
188	*See* DOE/ET/53088-188	E 1.99:	DE85014764	MN -20f	19:40964
194	*See* DOE/ET-53088-194	E 1.99:	DE85014767	MN -20g	19:40961
IFT-P-					
05/ 84	NTIS (US Sales Only), PC A02/MF A01		DE85701695	MN -34D	19:40618
07/ 84	NTIS (US Sales Only), PC A02/MF A01		DE85701696	MN -34D	19:40619
08/ 84	NTIS (US Sales Only), PC A02/MF A01		DE85701697	MN -34D	19:40620
09/ 84	NTIS (US Sales Only), PC A03/MF A01		DE85701698	MN -34D	19:40621
11/ 84	NTIS (US Sales Only), PC A02/MF A01		DE85701709	MN -34A	19:40918
IFVE-					
84-54	NTIS (US Sales Only), PC A02/MF A01		DE85701797	MN -34D	19:40516
IFVE-OEF-					
83-131	NTIS (US Sales Only), PC A02/MF A01		DE85701767	MN -34A	19:39721

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84-14	NTIS (US Sales Only), PC A02/MF A01	DE85701773	MN -34D	19:40568
84-39	NTIS (US Sales Only), PC A02/MF A01	DE85781338	MN -37	19:39904
84-66	NTIS (US Sales Only), PC A02/MF A01	DE85781301	MN -37	19:39905
84-82	NTIS (US Sales Only), PC A02/MF A01	DE85781339	MN -37	19:39906
84-83	NTIS (US Sales Only), PC A02/MF A01	DE85781340	MN -37	19:39907
84-97	NTIS (US Sales Only), PC A02/MF A01	DE85701793	MN -34D	19:40517
84-98	NTIS (US Sales Only), PC A02/MF A01	DE85701794	MN -34D	19:40518
84-105	NTIS (US Sales Only), PC A02/MF A01	DE85781337	MN -37	19:39908
IFVE-OEIPK-				
84-118	NTIS (US Sales Only), PC A02/MF A01	DE85781341	MN -37	19:39909
IFVE-OKU-				
84-89	NTIS (US Sales Only), PC A02/MF A01	DE85701897	MN -28	19:39837
IFVE-OKU-OUNK-				
84-23	NTIS (US Sales Only), PC A02/MF A01	DE85701645	MN -28	19:39807
IFVE-OMVT-				
84-92	NTIS (US Sales Only), PC A02/MF A01	DE85701646	MN -28	19:39808
IFVE-ONF-				
83-143	NTIS (US Sales Only), PC A02/MF A01	DE85701795	MN -34D	19:40519
83-173	NTIS (US Sales Only), PC A02/MF A01	DE85701787	MN -34D	19:40520
84-69	NTIS (US Sales Only), PC A02/MF A01	DE85701788	MN -34D	19:40521
84-84	NTIS (US Sales Only), PC A02/MF A01	DE85701770	MN -34D	19:40569
84-124	NTIS (US Sales Only), PC A02/MF A01	DE85781302	MN -37	19:39910
IFVE-OTF-				
84-29	NTIS (US Sales Only), PC A02/MF A01	DE85701722	MN -34D	19:40934
84-30	NTIS (US Sales Only), PC A02/MF A01	DE85701774	MN -34D	19:40570
84-37	NTIS (US Sales Only), PC A02/MF A01	DE85701775	MN -34D	19:40571
84-38	NTIS (US Sales Only), PC A02/MF A01	DE85701719	MN -34D	19:40935
84-85	NTIS (US Sales Only), PC A02/MF A01	DE85701796	MN -34D	19:40522
84-86	NTIS (US Sales Only), PC A02/MF A01	DE85701720	MN -34D	19:40936
IFVE-OUNK-				
83-121	NTIS (US Sales Only), PC A02/MF A01	DE85701902	MN -28	19:39883
83-158	NTIS (US Sales Only), PC A02/MF A01	DE85701903	MN -28	19:39722
84-28	NTIS (US Sales Only), PC A02/MF A01	DE85701888	MN -28	19:39809
84-68	NTIS (US Sales Only), PC A02/MF A01	DE85701644	MN -28	19:39810
IKE-				
2-69	NTIS (US Sales Only), PC A09/MF A01	DE85752022	MN -38	19:39311
5-220	NTIS (US Sales Only), PC A06/MF A01	DE85752357	MN -38	19:39753
8-10	NTIS (US Sales Only), PC A04/MF A01	DE85752204	MN -95d	19:39442
ILWRP-				
84-P2	*See* AERE-R-11411		ND -70	19:38869
IMMR-				
84-093	*See* PB-85-174944/XAB			19:38725
84-098	*See* PB-85-187961/XAB			19:39785
84-099	*See* PB-85-189801/XAB			19:38769
INDC(CCP)-				
229/ L	NTIS (US Sales Only), PC A04/MF A01	DE85781276	MN -34C	19:40649
INIS-BR-				
247	NTIS (US Sales Only), PC A02/MF A01	DE85781442	MN -38	19:39754
249	NTIS (US Sales Only), PC A06/MF A01	DE85781418	MN -78	19:39120
250	NTIS (US Sales Only), PC A08/MF A01	DE85781449	MN -48	19:40282
255	NTIS (US Sales Only), PC A05/MF A01	DE85781433	MN -80	19:39176
256	NTIS (US Sales Only), PC A09/MF A01	DE85781428	MN -79	19:39149
258	NTIS (US Sales Only), PC A07/MF A01	DE85781448	MN -51	19:40333
259	NTIS (US Sales Only), PC A08/MF A01	DE85781435	MN -80	19:39192
260	NTIS (US Sales Only), PC A20/MF A01	DE85781434	MN -80	19:39124
262	NTIS (US Sales Only), PC A06/MF A01	DE85781511	MN -32	19:40390
269	NTIS (US Sales Only), PC A03/MF A01	DE85781494	MN -2	19:39158
279	NTIS (US Sales Only), PC A10/MF A01	DE85781265	MN -34A	19:41065
281	NTIS (US Sales Only), PC A09/MF A01	DE85781490	MN -78	19:39126
INIS-mf-				
4754-No.27	NTIS (US Sales Only), PC A04/MF A01	DE85781266	MN -20	19:40969
9266	NTIS (US Sales Only), PC A05/MF A01	DE85780896	MN -4	19:39703
9298	NTIS (US Sales Only), PC A06/MF A01	DE85781348	MN -78	19:39315
9301	NTIS (US Sales Only), PC A07/MF A01	DE85781345	MN -80	19:39194
9304	NTIS (US Sales Only), PC A08/MF A01	DE85781350	MN -37	19:39912
9307	NTIS (US Sales Only), PC A06/MF A01	DE85781415	MN -51	19:38828
9308	NTIS (US Sales Only), PC A08/MF A01	DE85781408	MN -71	19:38851
9309	NTIS (US Sales Only), PC A04/MF A01	DE85781450	MN -41	19:40283
9311	NTIS (US Sales Only), PC A21/MF A01	DE85781453	MN -34D	19:40497
9314	NTIS (US Sales Only), PC A05/MF A01	DE85781262	MN -34A	19:40445
9426	NTIS (US Sales Only), PC A02/MF A01	DE85781443	MN -28	19:39791
9479	NTIS (US Sales Only), PC A15/MF A01	DE85781346	MN -80	19:39109
9487	NTIS (US Sales Only), PC A04/MF A01	DE85701686	MN -2	19:41071
9488	NTIS (US Sales Only), PC A03/MF A01	DE85701687	MN -2	19:41072
9513	NTIS (US Sales Only), PC A02/MF A01	DE85781401	MN -2	19:39387
9514	NTIS (US Sales Only), PC A02/MF A01	DE85781402	MN -2	19:39388
9515	NTIS (US Sales Only), PC A02/MF A01	DE85781356	MN -2	19:39389
9516	NTIS (US Sales Only), PC A02/MF A01	DE85781357	MN -2	19:39390
9517	NTIS (US Sales Only), PC A02/MF A01	DE85781355	MN -2	19:38863
9518	NTIS (US Sales Only), PC A02/MF A01	DE85781403	MN -2	19:39391
9519	NTIS (US Sales Only), PC A02/MF A01	DE85781358	MN -2	19:39331
9520	NTIS (US Sales Only), PC A05/MF A01	DE85781400	MN -2	19:39332
9521	NTIS (US Sales Only), PC A02/MF A01	DE85781359	MN -2	19:39333
9528	NTIS (US Sales Only), PC A02/MF A01	DE85781404	MN -16	19:39392

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9529	NTIS (US Sales Only), PC A02/MF A01	DE85781353	MN -2	19:39393
9530	NTIS (US Sales Only), PC A02/MF A01	DE85781354	MN -80	19:39334
9566	NTIS (US Sales Only), PC A02/MF A01	DE85781491	MN -37	19:39957
9567	NTIS (US Sales Only), PC A03/MF A01	DE85781512	MN -32	19:41085
9568	NTIS (US Sales Only), PC A02/MF A01	DE85781263	MN -34A	19:40446
9569	NTIS (US Sales Only), PC A02/MF A01	DE85781264	MN -34A	19:40447
9572	NTIS (US Sales Only), PC A06/MF A01	DE85781268	MN -34D	19:40583
9573-Vol.1	NTIS (US Sales Only), PC A09/MF A01	DE85781445	MN -37	19:40251
9573-Vol.2	NTIS (US Sales Only), PC A07/MF A01	DE85781409	MN -71	19:40236
9573-Vol.3	NTIS (US Sales Only), PC A06/MF A01	DE85781444	MN -37	19:40254
9573-Vol.4	NTIS (US Sales Only), PC A09/MF A01	DE85781451	MN -48	19:40260
9573-Vol.5	NTIS (US Sales Only), PC A05/MF A01	DE85781440	MN -4	19:40237
9592	NTIS (US Sales Only), PC A02/MF A01	DE85781351	MN -2	19:39134
9608	NTIS (US Sales Only), PC A02/MF A01	DE85781349	MN -80	19:39135
9624	NTIS (US Sales Only), PC A09/MF A01	DE85781454	MN -41	19:40900
9629	NTIS (US Sales Only), PC A03/MF A01	DE85781347	MN -78	19:39113
9635	NTIS (US Sales Only), PC A02/MF A01	DE85781419	MN -80	19:39136
9636	NTIS (US Sales Only), PC A02/MF A01	DE85781420	MN -80	19:39137
9637	NTIS (US Sales Only), PC A02/MF A01	DE85781421	MN -80	19:39138
9638	NTIS (US Sales Only), PC A03/MF A01	DE85781422	MN -80	19:39139
9639	NTIS (US Sales Only), PC A02/MF A01	DE85781423	MN -80	19:39140
9640	NTIS (US Sales Only), PC A02/MF A01	DE85781424	MN -80	19:39207
9641	NTIS (US Sales Only), PC A02/MF A01	DE85781425	MN -80	19:39337
9642	NTIS (US Sales Only), PC A02/MF A01	DE85781426	MN -80	19:39208
9643	NTIS (US Sales Only), PC A02/MF A01	DE85781427	MN -80	19:39141
9644	NTIS (US Sales Only), PC A08/MF A01	DE85781436	MN -2	19:39398
9645	NTIS (US Sales Only), PC A05/MF A01	DE85781446	MN -37	19:40067
9646	NTIS (US Sales Only), PC A05/MF A01	DE85781447	MN -37	19:40071
9653	NTIS (US Sales Only), PC A03/MF A01	DE85781452	MN -41	19:40902
9654	NTIS (US Sales Only), PC A02/MF A01	DE85781416	MN -70	19:38896
9655	NTIS (US Sales Only), PC A04/MF A01	DE85781441	MN -4	19:40340
9656	NTIS (US Sales Only), PC A02/MF A01	DE85781437	MN -2	19:40903
9657	NTIS (US Sales Only), PC A02/MF A01	DE85781410	MN -2	19:38853
9658	NTIS (US Sales Only), PC A02/MF A01	DE85781411	MN -2	19:38854
9659	NTIS (US Sales Only), PC A02/MF A01	DE85781412	MN -2	19:38855
9660	NTIS (US Sales Only), PC A02/MF A01	DE85781413	MN -2	19:38856
9661	NTIS (US Sales Only), PC A02/MF A01	DE85781429	MN -2	19:39159
9662	NTIS (US Sales Only), PC A02/MF A01	DE85781438	MN -2	19:40904
9663	NTIS (US Sales Only), PC A02/MF A01	DE85781455	MN -2	19:39160
9664	NTIS (US Sales Only), PC A02/MF A01	DE85781430	MN -2	19:39339
9665	NTIS (US Sales Only), PC A02/MF A01	DE85781431	MN -2	19:39161
9666	NTIS (US Sales Only), PC A02/MF A01	DE85781414	MN -2	19:38897
9673	NTIS (US Sales Only), PC A02/MF A01	DE85781417	MN -2	19:38955
9674	NTIS (US Sales Only), PC A03/MF A01	DE85781432	MN -2	19:39162
9681	NTIS (US Sales Only), PC A02/MF A01	DE85781514	MN -2	19:41073
9682	NTIS (US Sales Only), PC A04/MF A01	DE85781513	MN -2	19:39229
9684	NTIS (US Sales Only), PC A13/MF A01	DE85781495	MN -2	19:39340
9689	NTIS (US Sales Only), PC A02/MF A01	DE85781492	MN -2	19:41100
9690	NTIS (US Sales Only), PC A02/MF A01	DE85781269	MN -34D	19:40584
9691	NTIS (US Sales Only), PC A03/MF A01	DE85781270	MN -34D	19:40585
9692	NTIS (US Sales Only), PC A02/MF A01	DE85781271	MN -34D	19:40586
9694	NTIS (US Sales Only), PC A02/MF A01	DE85701743	MN -34A	19:40449
9696	NTIS (US Sales Only), PC A02/MF A01	DE85701752	MN -34A	19:39520
9702	NTIS (US Sales Only), PC A02/MF A01	DE85701745	MN -34A	19:39612
9703	NTIS (US Sales Only), PC A02/MF A01	DE85781406	MN -37	19:40075
9704	NTIS (US Sales Only), PC A02/MF A01	DE85781325	MN -80	19:39144
9705	NTIS (US Sales Only), PC A02/MF A01	DE85701746	MN -34A	19:39613
9706	NTIS (US Sales Only), PC A02/MF A01	DE85701747	MN -34A	19:40450
9716	NTIS (US Sales Only), PC A02/MF A01	DE85781498	MN -2	19:40905
9717	NTIS (US Sales Only), PC A03/MF A01	DE85781499	MN -2	19:38956
9718	NTIS (US Sales Only), PC A02/MF A01	DE85781500	MN -2	19:40906
9719	NTIS (US Sales Only), PC A05/MF A01	DE85781501	MN -2	19:40907
9720	NTIS (US Sales Only), PC A02/MF A01	DE85781502	MN -2	19:39399
9721	NTIS (US Sales Only), PC A05/MF A01	DE85781503	MN -2	19:40908
9722	NTIS (US Sales Only), PC A02/MF A01	DE85781507	MN -2	19:38957
9723	NTIS (US Sales Only), PC A02/MF A01	DE85781504	MN -2	19:40909
9724	NTIS (US Sales Only), PC A02/MF A01	DE85781508	MN -2	19:38958
9725	NTIS (US Sales Only), PC A02/MF A01	DE85781509	MN -2	19:41101
9726	NTIS (US Sales Only), PC A03/MF A01	DE85781493	MN -2	19:41102
9727	NTIS (US Sales Only), PC A02/MF A01	DE85781505	MN -2	19:40910
9732	NTIS (US Sales Only), PC A02/MF A01	DE85781510	MN -2	19:38829
9733	NTIS (US Sales Only), PC A03/MF A01	DE85781506	MN -2	19:40911
9735	NTIS (US Sales Only), PC A02/MF A01	DE85781496	MN -2	19:39163
9736	NTIS (US Sales Only), PC A02/MF A01	DE85781497	MN -2	19:39128
INIS-SU-				
289	NTIS (US Sales Only), PC A17/MF A01	DE85781267	MN -20	19:39792
INP-				
1161/ D	NTIS (US Sales Only), PC A04/MF A01	DE85701883	MN -28	19:39793
INPE-				
2617	NTIS (US Sales Only), PC A09/MF A01	DE85781042	MN -34B	19:40400
2743	NTIS (US Sales Only), PC A05/MF A01	DE85781043	MN -34B	19:40401
2811	NTIS (US Sales Only), PC A02/MF A01	DE85701711	MN -34A	19:39521
2813	NTIS (US Sales Only), PC A02/MF A01	DE85701712	MN -34A	19:39522
2907	NTIS (US Sales Only), PC A02/MF A01	DE85781044	MN -34B	19:40402

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
3066	NTIS (US Sales Only), PC A02/MF A01	DE85701714	MN -34A	19:39615
3081	NTIS (US Sales Only), PC A02/MF A01	DE85701715	MN -34A	19:39771
INS-R-				
321	NTIS (US Sales Only), PC A03/MF A01	DE85701688	MN -2	19:41074
IOS-Rep-				
185	NTIS (US Sales Only), PC A06/MF A01	DE85781084	MN -51	19:38898
IPEN-Pub-				
64	NTIS (US Sales Only), PC A02/MF A01	DE85781069	MN -4	19:39672
IPPJ-				
644	NTIS (US Sales Only), PC A02/MF A01	DE85701298	MN -20	19:40970
IS-M-				
538	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015518	MN -25	19:39523
546	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015521	MN -90b	19:38754
553	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015260	MN -34	19:40931
IS-T-				
1136	NTIS, PC A10/MF A01 (GPO Dep.)	E 1.99: DE85015589	MN -4	19:40919
ISD-				
306	NTIS (US Sales Only), PC A07/MF A01	DE85752028	MN -78	19:39341
ISPO-				
219	*See* LA-10382-MS	E 1.99: DE85015366	STD -15	19:38961
ITA-PS-				
1	NTIS (US Sales Only), PC A04/MF A01	DE85781056	MN -34C	19:40403
ITEF-				
2(1984)	NTIS (US Sales Only), PC A02/MF A01	DE85701895	MN -28	19:39840
11(1984)	NTIS (US Sales Only), PC A03/MF A01	DE85781040	MN -20	19:40971
21(1984)	NTIS (US Sales Only), PC A02/MF A01	DE85701889	MN -28	19:39811
26(1983)	NTIS (US Sales Only), PC A02/MF A01	DE85701806	MN -34C	19:40341
79(1983)	NTIS (US Sales Only), PC A02/MF A01	DE85781303	MN -37	19:40078
105(1983)	NTIS (US Sales Only), PC A02/MF A01	DE85701884	MN -28	19:39841
174(1983)	NTIS (US Sales Only), PC A02/MF A01	DE85781342	MN -37	19:39984
175(1983)	NTIS (US Sales Only), PC A02/MF A01	DE85701894	MN -28	19:39842
176(1983)	NTIS (US Sales Only), PC A04/MF A01	DE85701726	MN -34D	19:40623
ITEP-				
39(1983)	NTIS (US Sales Only), PC A04/MF A01	DE85701798	MN -34D	19:40527
41(1984)	NTIS (US Sales Only), PC A02/MF A01	DE85701776	MN -34D	19:40588
109(1984)	NTIS (US Sales Only), PC A02/MF A01	DE85701764	MN -34B	19:40404
110(1983)	NTIS (US Sales Only), PC A02/MF A01	DE85701771	MN -34D	19:40528
ITP-				
83-141-R	NTIS (US Sales Only), PC A02/MF A01	DE85701762	MN -34B	19:40405
83-167-R	NTIS (US Sales Only), PC A03/MF A01	DE85701756	MN -20	19:40972
83-170-R	NTIS (US Sales Only), PC A02/MF A01	DE85701765	MN -34B	19:40406
84-65-R	NTIS (US Sales Only), PC A02/MF A01	DE85701763	MN -34B	19:40407
84-94-R	NTIS (US Sales Only), PC A02/MF A01	DE85701777	MN -34D	19:40589
ITP-				
83-128-E	NTIS (US Sales Only), PC A02/MF A01	DE85701778	MN -34D	19:40590
IWGFR-				
49-Vol.1	NTIS (US Sales Only), PC A20/MF A01	DE85781280	MN -79h	19:39547
JAERI-M-				
83-119	NTIS (US Sales Only), PC A03/MF A01	DE85701605	MN -4	19:39596
83-124	NTIS (US Sales Only), PC A03/MF A01	DE85701604	MN -4	19:39704
83-126	NTIS (US Sales Only), PC A06/MF A01	DE85701606	MN -4	19:39698
83-128	NTIS (US Sales Only), PC A07/MF A01	DE85701600	MN -4	19:39597
83-149	NTIS (US Sales Only), PC A04/MF A01	DE85701601	MN -4	19:40187
83-168	NTIS (US Sales Only), PC A02/MF A01	DE85701599	MN -4	19:39705
83-197	NTIS (US Sales Only), PC A03/MF A01	DE85701666	MN -70	19:38899
83-199	NTIS (US Sales Only), PC A05/MF A01	DE85701607	MN -4	19:39699
83-211	NTIS (US Sales Only), PC A05/MF A01	DE85701648	MN -80	19:39230
83-217	NTIS (US Sales Only), PC A05/MF A01	DE85701649	MN -80	19:39154
83-218	NTIS (US Sales Only), PC A06/MF A01	DE85701667	MN -70	19:38900
83-223	NTIS (US Sales Only), PC A03/MF A01	DE85701807	MN -34C	19:40872
83-235	NTIS (US Sales Only), PC A09/MF A01	DE85701753	MN -34A	19:41037
84-018	NTIS (US Sales Only), PC A03/MF A01	DE85701808	MN -34C	19:40873
84-049	NTIS (US Sales Only), PC A05/MF A01	DE85701741	MN -34A	19:40452
84-050	NTIS (US Sales Only), PC A05/MF A01	DE85701642	MN -41	19:39342
84-068	NTIS (US Sales Only), PC A07/MF A01	DE85701626	MN -34B	19:40142
84-069	NTIS (US Sales Only), PC A07/MF A01	DE85701742	MN -34A	19:40453
84-070	NTIS (US Sales Only), PC A03/MF A01	DE85701668	MN -70	19:38901
84-080	NTIS (US Sales Only), PC A03/MF A01	DE85701610	MN -25	19:39548
84-087	NTIS (US Sales Only), PC A04/MF A01	DE85701615	MN -25	19:41038
84-096	NTIS (US Sales Only), PC A02/MF A01	DE85701653	MN -77	19:39132
84-100	NTIS (US Sales Only), PC A10/MF A01	DE85701652	MN -78	19:39343
JINR-				
1-83-569	NTIS (US Sales Only), PC A02/MF A01	DE85701789	MN -34D	19:40529
1-84-372	NTIS (US Sales Only), PC A02/MF A01	DE85701755	MN -34A	19:40874
2-84-426	NTIS (US Sales Only), PC A02/MF A01	DE85701784	MN -34D	19:40591
8-83-717	NTIS (US Sales Only), PC A02/MF A01	DE85701769	MN -34A	19:39724
9-84-480	NTIS (US Sales Only), PC A02/MF A01	DE85701899	MN -28	19:39844
9-84-523	NTIS (US Sales Only), PC A02/MF A01	DE85701885	MN -28	19:39794
9-84-555	NTIS (US Sales Only), PC A04/MF A01	DE85701900	MN -28	19:39845
9-84-581	NTIS (US Sales Only), PC A02/MF A01	DE85701886	MN -28	19:39795
10-84-204	NTIS (US Sales Only), PC A02/MF A01	DE85781330	MN -37	19:39986
10-84-450	NTIS (US Sales Only), PC A02/MF A01	DE85781289	MN -37	19:39987
10-84-529	NTIS (US Sales Only), PC A02/MF A01	DE85781320	MN -32	19:39796
10-84-670	NTIS (US Sales Only), PC A02/MF A01	DE85781309	MN -37	19:39772

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
11-84-505	NTIS (US Sales Only), PC A02/MF A01	DE85701891	MN -28	19:39812
13-84-34	NTIS (US Sales Only), PC A02/MF A01	DE85781332	MN -37	19:39988
13-84-54	NTIS (US Sales Only), PC A02/MF A01	DE85781333	MN -37	19:39989
13-84-161	NTIS (US Sales Only), PC A02/MF A01	DE85781290	MN -37	19:39990
13-84-213	NTIS (US Sales Only), PC A02/MF A01	DE85781331	MN -37	19:39991
13-84-227	NTIS (US Sales Only), PC A02/MF A01	DE85701662	MN -37	19:40079
13-84-373	NTIS (US Sales Only), PC A02/MF A01	DE85701665	MN -37	19:39992
13-84-375	NTIS (US Sales Only), PC A02/MF A01	DE85781291	MN -37	19:39993
13-84-382	NTIS (US Sales Only), PC A02/MF A01	DE85781292	MN -37	19:39994
13-84-394	NTIS (US Sales Only), PC A02/MF A01	DE85781293	MN -37	19:39995
13-84-395	NTIS (US Sales Only), PC A02/MF A01	DE85781294	MN -37	19:39996
13-84-542	NTIS (US Sales Only), PC A02/MF A01	DE85781334	MN -37	19:39997
13-84-566	NTIS (US Sales Only), PC A02/MF A01	DE85781310	MN -37	19:40080
13-84-576	NTIS (US Sales Only), PC A02/MF A01	DE85781311	MN -37	19:40081
13-84-582	NTIS (US Sales Only), PC A02/MF A01	DE85781295	MN -37	19:39998
13-84-604	NTIS (US Sales Only), PC A02/MF A01	DE85781296	MN -37	19:39999
13-84-605	NTIS (US Sales Only), PC A02/MF A01	DE85781297	MN -37	19:40000
13-84-652	NTIS (US Sales Only), PC A02/MF A01	DE85781298	MN -37	19:40001
D-1-84-405	NTIS (US Sales Only), PC A02/MF A01	DE85781343	MN -37	19:40003
D-3-84-196	NTIS (US Sales Only), PC A02/MF A01	DE85781304	MN -37	19:40082
D-13-84-53	NTIS (US Sales Only), PC A20/MF A01	DE85781324	MN -28	19:39779
D-13-84-259	NTIS (US Sales Only), PC A02/MF A01	DE85781344	MN -37	19:40027
E-1-84-280	NTIS (US Sales Only), PC A02/MF A01	DE85701799	MN -34D	19:40530
E-1-84-444	NTIS (US Sales Only), PC A02/MF A01	DE85781283	MN -37	19:40028
E-2-84-228	NTIS (US Sales Only), PC A02/MF A01	DE85701699	MN -34D	19:40624
E-2-84-257	NTIS (US Sales Only), PC A02/MF A01	DE85701700	MN -34D	19:40625
E-2-84-479	NTIS (US Sales Only), PC A02/MF A01	DE85701727	MN -34D	19:40626
E-2-84-499	NTIS (US Sales Only), PC A02/MF A01	DE85701737	MN -34D	19:40627
E-2-84-506	NTIS (US Sales Only), PC A02/MF A01	DE85701809	MN -34C	19:40875
E-2-84-660	NTIS (US Sales Only), PC A02/MF A01	DE85701728	MN -34D	19:40628
E-13-84-473	NTIS (US Sales Only), PC A02/MF A01	DE85701664	MN -37	19:40029
E-13-84-640	NTIS (US Sales Only), PC A02/MF A01	DE85781284	MN -37	19:40030
E-14-83-605	NTIS (US Sales Only), PC A02/MF A01	DE85701748	MN -34A	19:40456
R-1-83-519	NTIS (US Sales Only), PC A02/MF A01	DE85701904	MN -28	19:39854
R-1-84-311	NTIS (US Sales Only), PC A02/MF A01	DE85701800	MN -34D	19:40531
R-1-84-546	NTIS (US Sales Only), PC A02/MF A01	DE85781285	MN -37	19:40031
R-1-84-657	NTIS (US Sales Only), PC A02/MF A01	DE85701801	MN -34D	19:40532
R-1-84-658	NTIS (US Sales Only), PC A02/MF A01	DE85701802	MN -34D	19:40533
R-2-83-842	NTIS (US Sales Only), PC A02/MF A01	DE85701779	MN -34D	19:40592
R-2-84-10	NTIS (US Sales Only), PC A02/MF A01	DE85701780	MN -34D	19:40593
R-2-84-64	NTIS (US Sales Only), PC A02/MF A01	DE85701782	MN -34D	19:40594
R-2-84-229	NTIS (US Sales Only), PC A02/MF A01	DE85701729	MN -34D	19:40629
R-2-84-383	NTIS (US Sales Only), PC A02/MF A01	DE85701739	MN -34A	19:40457
R-2-84-412	NTIS (US Sales Only), PC A02/MF A01	DE85701781	MN -34D	19:40595
R-2-84-458	NTIS (US Sales Only), PC A02/MF A01	DE85701730	MN -34D	19:40630
R-2-84-466	NTIS (US Sales Only), PC A02/MF A01	DE85701731	MN -34D	19:40631
R-2-84-672	NTIS (US Sales Only), PC A02/MF A01	DE85701732	MN -34D	19:40632
R-3-83-892	NTIS (US Sales Only), PC A02/MF A01	DE85701804	MN -46	19:40876
R-3-84-219	NTIS (US Sales Only), PC A02/MF A01	DE85781307	MN -37	19:40032
R-4-83-560	NTIS (US Sales Only), PC A02/MF A01	DE85701783	MN -34D	19:40596
R-5-84-541	NTIS (US Sales Only), PC A02/MF A01	DE85701721	MN -34D	19:40937
R-6-84-554	NTIS (US Sales Only), PC A02/MF A01	DE85781329	MN -37	19:40033
R-8-83-373	NTIS (US Sales Only), PC A02/MF A01	DE85701768	MN -34A	19:39725
R-9-84-254	NTIS (US Sales Only), PC A02/MF A01	DE85701896	MN -28	19:39855
R-9-84-270	NTIS (US Sales Only), PC A02/MF A01	DE85701647	MN -28	19:39813
R-9-84-594	NTIS (US Sales Only), PC A02/MF A01	DE85701898	MN -28	19:39856
R-9-84-631	NTIS (US Sales Only), PC A02/MF A01	DE85701890	MN -28	19:39814
R-10-84-440	NTIS (US Sales Only), PC A02/MF A01	DE85781305	MN -37	19:40034
R-13-84-59	NTIS (US Sales Only), PC A02/MF A01	DE85701905	MN -28	19:39857
R-13-84-239	NTIS (US Sales Only), PC A02/MF A01	DE85781286	MN -37	19:40035
R-13-84-249	NTIS (US Sales Only), PC A02/MF A01	DE85781287	MN -37	19:40036
R-13-84-285	NTIS (US Sales Only), PC A02/MF A01	DE85781288	MN -37	19:40037
R-13-84-294	NTIS (US Sales Only), PC A02/MF A01	DE85781328	MN -37	19:40088
R-13-84-454	NTIS (US Sales Only), PC A02/MF A01	DE85781306	MN -37	19:40038
R-14-84-414	NTIS (US Sales Only), PC A02/MF A01	DE85701803	MN -46	19:40877
R-18-84-403	NTIS (US Sales Only), PC A02/MF A01	DE85701723	MN -34D	19:40938
R-18-84-404	NTIS (US Sales Only), PC A02/MF A01	DE85701661	MN -37	19:40089
R-19-84-286	NTIS (US Sales Only), PC A02/MF A01	DE85701629	MN -48	19:40289
JPL-PUB-				
84-23	*See* DOE/JPL-1012-95	E 1.99: DE84014619	STD -63b	19:39000
Juel-				
1892	NTIS (US Sales Only), PC A06/MF A01	DE85752023	MN -86	19:38843
1955	NTIS (US Sales Only), PC A06/MF A01	DE85752013	MN -86	19:38844
1974	NTIS (US Sales Only), PC A08/MF A01	DE85752360	MN -48	19:40312
Spez-296	NTIS (US Sales Only), PC A08/MF A01; 1	DE85752358	MN -11	19:40313
Juel-Spez-				
267	NTIS (US Sales Only), PC A05/MF A01	DE85752021	MN -70	19:38902
KFK-				
3800	Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Lab. fuer Aerosolphysik und Filtertechnik 1		ND -80	19:39344
KMU-HEP-				
84-03	NTIS (US Sales Only), PC A03/MF A01	DE85701733	MN -34D	19:40633
84-04	NTIS (US Sales Only), PC A02/MF A01	DE85701738	MN -34D	19:40634

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84-05	NTIS (US Sales Only), PC A02/MF A01		DE85701785	MN -34D	19:40597
84-06	NTIS (US Sales Only), PC A02/MF A01		DE85701734	MN -34D	19:40635
84-07	NTIS (US Sales Only), PC A02/MF A01		DE85701735	MN -34D	19:40636
LA-					
10187-MS	NTIS, PC A06/MF A01 (GPO Dep.)	E 1.99:	DE85015361	STD -34	19:40486
10350-M	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015359	STD -15	19:38959
10365-PR	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99:	DE85016207	STD -41	19:40324
10368-T	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015364	STD -34C	19:40717
10373-MS	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015367	STD -15	19:38960
10382-MS	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015366	STD -15	19:38961
10397-MS	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99:	DE85015360	STD -41	19:39726
10404-MS	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015353	STD -34	19:40939
10413-MS	*See* NUREG/CR-4232		TI85014221	MN -41	19:39731
10415-MS	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE85016208	STD -70	19:38903
10428-MS	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE85015362	STD -11	19:40342
10429-PR	NTIS, PC A12/MF A01 (GPO Dep.)	E 1.99:	DE85015365	STD -28	19:40498
10435-M	*See* NUREG/CR-4260		TI85014236	MN -41	19:39732
10439-MS	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015354	STD -34	19:40458
10448-MS	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015355	STD -28	19:39859
10455-MS	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85016215	STD -11	19:40343
LA-DC-					
9486	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015053	MN -32	19:40954
LA-tr-					
85-29	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014880	MN -28	19:39803
85-30	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015316	MN -45	19:40112
85-31	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015191	MN -45	19:40113
LA-UR-					
81-1507	NTIS, PC A02/MF A01		TI85015349	MN -78	19:39345
85-225	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85005964	MN -34A	19:40973
85-226	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85005963	MN -21	19:40974
85-1135	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85010779	MN -25	19:39549
85-1284	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85010705	MN -80	19:39616
85-1525	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85012694	MN -48	19:40235
85-1637	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85012649	MN -88	19:38734
85-1756	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85012748	MN -34C	19:40878
85-1870	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85012763	MN -80	19:39157
85-1933	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014134	MN -15	19:38962
85-1979	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014133	MN -34B	19:40411
85-1990	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014131	MN -34B	19:40412
85-1993	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014130	MN -38	19:39780
85-1999	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014127	MN -37	19:40090
85-2005	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014126	MN -34B	19:40413
85-2021	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014124	MN -38	19:39781
85-2022	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014123	MN -38	19:39782
85-2035	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014122	MN -32	19:41087
85-2047	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014119	MN -34C	19:40674
85-2055	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014118	MN -34A	19:39617
85-2057	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014117	MN -28	19:39860
85-2062	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014116	MN -37	19:39727
85-2070	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014115	MN -37	19:40042
85-2075	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014113	MN -34C	19:40854
85-2092	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014107	MN -34B	19:40430
85-2093	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014105	MN -34	19:40459
85-2106	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014104	MN -34A	19:40460
85-2119	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014103	MN -34C	19:40855
85-2175	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014094	MN -48	19:40206
85-2182	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014092	MN -38	19:39728
85-2192	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014090	MN -38	19:39861
85-2193	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014089	MN -79	19:39729
85-2221	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014081	MN -25	19:39474
85-2225	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85014080	MN -28	19:39862
85-2251	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014076	MN -25	19:39550
85-2265	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014074	MN -37	19:40059
85-2273	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014071	MN -91	19:38818
85-2292	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85014067	MN -34	19:41088
85-2311	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015686	MN -45	19:40102
85-2358	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015675	MN -45	19:39688
85-2362	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015674	MN -37	19:40091
85-2579	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015750	MN -37	19:40092
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18669	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014539	MN -95d	19:39444
18939	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015130	MN -28	19:39864
18951	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015272	MN -48	19:40222
18952	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015250	MN -48	19:40223
18954	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015249	MN -28	19:39815
18958	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015251	MN -28	19:39865
18960	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015116	MN -28	19:39816
18961	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015279	MN -28	19:39866
18964	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015271	MN -28	19:39867
18965	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015273	MN -28	19:39868

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18967	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015206	MN -28	19:39869
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18978	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015247	MN -48	19:40224
19011	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015276	MN -28	19:39870
19084	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014534	MN -38	19:39757
19481	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85014540	MN -34D	19:40225
19485	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015128	MN -28	19:39818
19492	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85014544	MN -95d	19:39445
19563	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015280	MN -28	19:39819
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19593	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015278	MN -28	19:39800
19603	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015274	MN -28	19:39822
19618	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014530	MN -34D	19:40534
19671	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85014537	MN -34D	19:40637
19694	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE85015133	MN -90d	19:38704
19711	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015197	MN -48	19:40319
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19795	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015253	MN -34C	19:40675
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84-01	NTIS (US Sales Only), PC A08/MF A01	DE85751935	MN -34C	19:40535
LR-				
490(OP) -M	*See* PB-85-180958/XAB			19:38798
LTR-				
115-9(Suppl.1)	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015462	MN -78	19:39232
MAC-				
730	*See* DOE/ER/40025-34	E 1.99: DE85014899	MN -34D	19:40566
MB-				
4/ 82	NTIS (US Sales Only), PC A12/MF A01	DE85781079	MN -25	19:39551
MI-				
63/ 84	*See* OEFZS-A-0506		ND -23	19:41089
MINTEK-M-				
64D	NTIS (US Sales Only), PC A03/MF A01	DE85781062	MN -4	19:39673
128	NTIS (US Sales Only), PC A03/MF A01	DE85781061	MN -4	19:39674
134	NTIS (US Sales Only), PC A03/MF A01	DE85781066	MN -4	19:39675
MIT-EL-				
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3267	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015607	STD -25	19:39475
3268	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015613	STD -25	19:39476
3272	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE85015610	STD -25	19:39618
MPI-PAE/Exp.El.-				
146	NTIS (US Sales Only), PC A02/MF A01	DE85752024	MN -34D	19:40536
147	NTIS (US Sales Only), PC A02/MF A01	DE85752027	MN -37	19:40043
148	NTIS (US Sales Only), PC A02/MF A01	DE85752025	MN -34D	19:40537
149	NTIS (US Sales Only), PC A02/MF A01	DE85752026	MN -37	19:40044
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76/ 84	*See* DESY-84-123	DE85752006	MN -34D	19:40610
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85-20143	Subcommittee on Fossil and Synthetic; Fuels			19:39403
85-21162	NTIS, PC A02/MF A01			19:39710
85-21282	NTIS, PC A02/MF A01			19:39711
85-21283	NTIS, PC A03/MF A01			19:39712
85-21320	NTIS, PC A09/MF A01			19:39552
85-21397	NTIS, PC A02/MF A01			19:38988
85-21571	NTIS, PC A03/MF A01			19:39730
NASA-CR-				
174841	*See* N-85-21320			19:39552
175496	*See* N-85-21571			19:39730
175535	*See* N-85-21397			19:38988
175586	*See* N-85-21283			19:39712
NASA-TM-				
83590	*See* N-85-21162			19:39710
NBS-BSS-				
163	GPO	TI85901698	MN -95d	19:39446
NBSIR-				
85-3131	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99: DE85015257	MN -95d	19:40093
NC/CEIP-				
41	*See* UNC-WRRI-214	TI85901851	MN -88	19:38738
ND-R-				
814(S) Pt.3	H.M. Stationery Office, London, price Pound 4.00		ND -78	19:39347
1093(R)	NTIS (US Sales Only), PC A02/MF A01	DE85781318	MN -16	19:38963
NE-F-				
11-2T-Rev.-3-85	Nuclear Standards Management Center, P.O. Box Y, Oak Ridge, TN 37831	TI85013576	ND -79T	19:39683
NEDO-				
10723	General Electric Co., Nuclear Division, San Jose, CA 95125	TI85901850	MN -78	19:39348
NEL-				
693	NTIS (US Sales Only), PC A03/MF A01	DE85781080	MN -25	19:39553
NIIAR-				
39(604)	NTIS (US Sales Only), PC A02/MF A01	DE85701908	MN -25	19:39764

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NIIEFA-P-B-					
0611	NTIS (US Sales Only), PC A03/MF A01		DE85701887	MN -28	19:39801
NOAA/TM-ERL-PMEL-					
61	*See* PNL-SA-13268	E 1.99:	DE85015080	MN -11	19:40348
NP-					
5770321	NTIS (US Sales Only), PC A06/MF A01; 1		DE85770321	MN -61E	19:38983
5770322	NTIS (US Sales Only), PC A05/MF A01; 1		DE85770322	MN -11	19:40200
5770325	NTIS (US Sales Only), PC A07/MF A01; 1		DE85770325	MN -94cc	19:39758
5770326	NTIS (US Sales Only), PC A04/MF A01; 1		DE85770326	MN -05	19:39374
5770327	NTIS (US Sales Only), PC A03/MF A01; 1		DE85770327	MN -05	19:39375
5770328	NTIS (US Sales Only), PC A06/MF A01; 1		DE85770328	MN -60	19:39063
5901700	NTIS, PC A05/MF A01		DE85901700	MN -61E	19:39416
5901713	Wyoming Highway Dept., Billing Section, Box 1708, Cheyenne, WY 82002, $10.00		TI85901713	MN -88	19:38735
5901731	NTIS, PC A02/MF A01		DE85901731	MN -11	19:40178
5901732	NTIS, PC A02/MF A01		DE85901732	MN -11	19:40179
5901733	NTIS, PC A02/MF A01		DE85901733	MN -11	19:40180
5901843	NTIS, PC A06/MF A01; 1		DE85901843	MN -92	19:38985
5901849	California Energy Commission, 1516 Ninth Street, Sacramento, CA 95814		TI85901849	MN -92a	19:38795
NPL-RS-					
51	NTIS (US Sales Only), PC A02/MF A01		DE85701873	MN -23	19:40226
NRL-MR-					
5527	*See* AD-A-153843/8/XAB				19:39479
NUCLEBRAS-CDTN-					
472	NTIS (US Sales Only), PC A07/MF A01		DE85781063	MN -4	19:39676
473	NTIS (US Sales Only), PC A07/MF A01		DE85781067	MN -4	19:39677
474	NTIS (US Sales Only), PC A03/MF A01		DE85781076	MN -86	19:38830
476	NTIS (US Sales Only), PC A02/MF A01		DE85781077	MN -86	19:38831
477	NTIS (US Sales Only), PC A03/MF A01		DE85781078	MN -86	19:38832
479	NTIS (US Sales Only), PC A02/MF A01		DE85781081	MN -25	19:39689
NUREG-					
0540-Vol.7-No.4	NTIS, PC A21/MF A01 - GPO		TI85901728	MN -2	19:39164
0798-Suppl.6	NTIS, PC A04/MF A01 - GPO		TI85901852	MN -78	19:39349
0837-Vol.4-No.4	NTIS, PC A14/MF A01 - GPO		TI85901853	MN -41	19:40169
0837-Vol.5-No.1	NTIS, PC A07/MF A01 - GPO		TI85901860	MN -11	19:40170
0991-Suppl.5	NTIS, PC A03/MF A01 - GPO		TI85901848	MN -78	19:39350
1128	NTIS, PC A09/MF A01 - GPO		TI85901734	MN -78	19:39351
1148	NTIS, PC A03/MF A01 - GPO		TI85901873	MN -41	19:39352
NUREG/CR-					
3481-Vol.2	NTIS, PC A11/MF A01 - GPO		TI85014906	MN -2	19:41075
3638	NTIS, PC A06/MF A01 - GPO (GPO Dep.)	E 1.99:	TI85015372	MN -78	19:39353
3660-Vol.1	NTIS, PC A06/MF A01 - GPO		TI85015267	MN -78	19:39354
3901	NTIS PC E12/MF A01 - GPO		TI85901859	MN -70	19:38914
4038	NTIS PC E13/MF A01 - GPO		TI85011554	MN -11	19:39355
4137	NTIS, PC A04/MF A01 - GPO		TI85015569	MN -78	19:39356
4138	NTIS, PC A08/MF A01 - GPO		TI85015258	MN -80	19:39357
4213	NTIS, PC A11/MF A01 - GPO		TI85016136	MN -80	19:39358
4232	NTIS, PC A04/MF A01 - GPO		TI85014221	MN -41	19:39731
4239	NTIS, PC A14/MF A01 - GPO		TI85015800	MN -41	19:40045
4240-Vol.1	NTIS, PC A02/MF A01 - GPO		TI85014330	MN -79p	19:39359
4248	NTIS, PC A08/MF A01 - GPO		TI85015538	MN -80	19:39360
4249	NTIS, PC A11/MF A01 - GPO		TI85013517	MN -78	19:39129
4260	NTIS, PC A07/MF A01 - GPO		TI85014236	MN -41	19:39732
4268	NTIS, PC A05/MF A01 - GPO		TI85015820	MN -70B	19:38915
4271	NTIS, PC A06/MF A01 - GPO		TI85901741	MN -70	19:38916
4288	NTIS PC E06/MF $5.50 - GPO		TI85901862	MN -11	19:40378
4290-Vol.2	NTIS, PC A07/MF A01 - GPO		TI85015373	MN -78	19:39361
4298	NTIS, PC A09/MF A01 - GPO		TI85015255	MN -15	19:39211
4317-Vol.1	NTIS, PC A04/MF A01 - GPO		TI85901893	MN -11	19:40379
NUS-					
4382	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014744	MN -78	19:39362
NYSERDA-					
85-3	Department of Communications, New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223		TI85901683	MN -60	19:39064
OA-tr-					
2728	NTIS (US Sales Only), PC A02/MF A01		DE85901486	MN -95d	19:39401
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1-102	NTIS (US Sales Only), PC A02/MF A01		DE85701633	MN -48	19:40294
1-103	NTIS (US Sales Only), PC A02/MF A01		DE85701636	MN -23	19:40295
1-105	NTIS (US Sales Only), PC A02/MF A01		DE85701621	MN -51	19:40171
1-106	NTIS (US Sales Only), PC A02/MF A01		DE85701632	MN -48	19:40296
OAP-IE-					
84-90	NTIS (US Sales Only), PC A05/MF A01		DE85781314	MN -70	19:38917
OCS/MMS-					
85-0012	Minerals Management Service, 12203 Sunrise Valley Dr., Reston, VA 22091		TI85901846	MN -92	19:38784
85-0021	Minerals Management Service, 12203 Sunrise Valley Dr., Reston, VA 22091		TI85901864	MN -92	19:38796
OEFZS-					
4309	Special print from HLH, Heizung, Lueft., Klimatech., Haustech. (Dec 1984) v. 35(12) p. 588-591			ND -62	19:39030

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OEFZS-A-				
0506	Author, OEFZS, A-2444 Seibersdorf, Austria		ND -23	19:41089
OEIPK-WA-				
27	*See* IFVE-84-54	DE85701797	MN -34D	19:40516
ORNL-				
6114	*See* NUREG/CR-4038	TI85011554	MN -11	19:39355
6136	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99: DE85015026	MN -95	19:39409
6138	NTIS, PC A06/MF A01 (GPO Dep.)	E 1.99: DE85015079	MN -79p	19:39363
6163	*See* NUREG/CR-4249	TI85013517	MN -78	19:39129
6165	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99: DE85014981	MN -97a	19:39102
6201	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99: DE85015070	STD -48	19:40297
ORNL/CON-				
179	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99: DE85014886	MN -97	19:39410
185	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99: DE85015031	MN -05	19:39447
ORNL/Sub-				
82-43309/ 1	NTIS, PC A06/MF A01 (GPO Dep.)	E 1.99: DE85015075	STD -78	19:39411
82-43309/ 2	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99: DE85015073	STD -78	19:39412
82-43309/ 3	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99: DE85015074	STD -78	19:39413
ORNL/TM-				
6803/ S5	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE85015052	MN -11	19:40175
9179/ R1	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99: DE85015077	MN -28	19:40879
9308/ V2	*See* NUREG/CR-3481-Vol.2	TI85014906	MN -2	19:41075
9362	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015054	MN -70	19:38918
9363	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE85015068	STD -20g	19:40975
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9411	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99: DE85015055	MN -13	19:41103
9531	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015065	STD -20g	19:40976
9598	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE85015064	STD -20g	19:40977
ORO-				
5172-0019	*See* DOE/ER/05172-0019	E 1.99: DE85014729	MN -34C	19:40712
OUP-				
83-1	NTIS (US Sales Only), PC A03/MF A01	DE85781073	MN -4	19:39706
83-02	NTIS (US Sales Only), PC A02/MF A01	DE85701702	MN -34A	19:40461
83-03	NTIS (US Sales Only), PC A03/MF A01	DE85701692	MN -34D	19:40940
83-05	NTIS (US Sales Only), PC A03/MF A01	DE85781057	MN -34C	19:40856
84-02	NTIS (US Sales Only), PC A03/MF A01	DE85781074	MN -4	19:39707
84-05	NTIS (US Sales Only), PC A03/MF A01	DE85781064	MN -4	19:39678
84-08	NTIS (US Sales Only), PC A04/MF A01	DE85701705	MN -34A	19:40462
84-12	NTIS (US Sales Only), PC A02/MF A01	DE85781045	MN -34D	19:40598
84-16	NTIS (US Sales Only), PC A02/MF A01	DE85781051	MN -34D	19:40538
84-17	NTIS (US Sales Only), PC A02/MF A01	DE85781058	MN -34C	19:40857
84-24	NTIS (US Sales Only), PC A03/MF A01	DE85781039	MN -20	19:40978
84-28	NTIS (US Sales Only), PC A02/MF A01	DE85781041	MN -20	19:40979
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PB-				
81-236119	NTIS, PC A05/MF A01	TI85901488	MN -90i	19:38724
85-174944/ XAB	NTIS, PC A05/MF A01			19:38725
85-175677/ XAB	NTIS, PC A04/MF A01			19:39103
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85-178291/ XAB	NTIS, PC A07/MF A01			19:38793
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85-183150/ XAB	NTIS PC E04/MF E04			19:39108
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85-185411/ XAB	NTIS, PC A05/MF A01			19:38729
85-185619/ XAB	NTIS PC E03/MF E03			19:39463
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85-185783/ XAB	NTIS, PC A05/MF A01			19:38737
85-185858/ XAB	NTIS, PC A12/MF A01			19:40118
85-185965/ XAB	NTIS PC E05/MF E05			19:39450
85-186054/ XAB	NTIS, PC A22/MF A01			19:39380
85-186641/ XAB	NTIS PC E04/MF E04			19:39364
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85-192235/ XAB	NTIS, PC A06/MF A01				19:38804
85-192250/ XAB	NTIS, PC A02/MF A01				19:39555
85-198414/ XAB	NTIS, PC A04/MF A01				19:38808
85-198422/ XAB	NTIS, PC A11/MF A01				19:38801
85-198430/ XAB	NTIS, PC A05/MF A01				19:38806
85-198471/ XAB	NTIS, PC A10/MF A01				19:38807
85-198489/ XAB	NTIS, PC A06/MF A01				19:39452
85-199644/ XAB	NTIS, PC A14/MF A01				19:38805
PCMRP-					
84-P14	*See* AERE-G-3159		DE85701876	MN -41	19:38867
PFC/CP-					
85-2	*See* DOE/ET/51013-148	E 1.99:	DE85015579	MN -20	19:40963
PFC/RR-					
84-20	*See* DOE/ET/51013-140	E 1.99:	DE85013650	MN -20	19:40962
PH-					
402/ 85	*See* OEFZS-4309			ND -62	19:39030
PN-					
3611-2	*See* AD-A-153092/2/XAB				19:40120
PNL-					
4189-Rev.1	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015320	MN -85	19:38857
4250-7	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99:	DE85015236	MN -70	19:38919
5109-Rev.1	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015807	MN -70	19:38858
5156	*See* NUREG/CR-4268		TI85015820	MN -70B	19:38915
5393	NTIS, PC A07/MF A01 (GPO Dep.)	E 1.99:	DE85015418	MN -70	19:38920
5407	NTIS, PC A07/MF A01 (GPO Dep.)	E 1.99:	DE85014393	MN -11	19:40197
5435	*See* NUREG/CR-4248		TI85015538	MN -80	19:39360
5470-1	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015808	MN -70	19:38921
5488	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE85015231	MN -70	19:38922
5490	*See* NUREG/CR-4298		TI85015255	MN -15	19:39211
5525	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE85015532	MN -95c	19:39465
5527	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE85008763	MN -32	19:41098
PNL-SA-					
12186	NTIS (US Sales Only), PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013497	MN -78	19:39365
12858	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013040	MN -34C	19:40721
13268	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015080	MN -11	19:40348
PPPL-					
2137	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015308	STD -20	19:40980
2190	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015100	STD -20d	19:41039
2227	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015309	STD -20	19:40981
2228	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015314	STD -20f	19:41040
2230	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015310	STD -20g	19:40982
2231	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015202	STD -20	19:41041
2233	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015311	STD -20	19:41042
PUC-TN-					
02/ 82	NTIS (US Sales Only), PC A02/MF A01		DE85701716	MN -34A	19:39620
03/ 82	NTIS (US Sales Only), PC A02/MF A01		DE85701717	MN -34A	19:39621
05/ 82	NTIS (US Sales Only), PC A03/MF A01		DE85781048	MN -34D	19:40599
17/ 82	NTIS (US Sales Only), PC A02/MF A01		DE85701706	MN -34A	19:40463
20/ 82	NTIS (US Sales Only), PC A02/MF A01		DE85701718	MN -34A	19:39556
23/ 82	NTIS (US Sales Only), PC A03/MF A01		DE85701707	MN -34A	19:40464
RAL-					
84-057	NTIS (US Sales Only), PC A02/MF A01		DE85701760	MN -20	19:40989
84-085	NTIS (US Sales Only), PC A02/MF A01		DE85701701	MN -34D	19:40607
84-087	NTIS (US Sales Only), PC A02/MF A01		DE85781046	MN -34D	19:40539
84-088	NTIS (US Sales Only), PC A02/MF A01		DE85781047	MN -34D	19:40600
84-094	NTIS (US Sales Only), PC A02/MF A01		DE85701772	MN -34D	19:40601
84-100	NTIS (US Sales Only), PC A02/MF A01		DE85781053	MN -46	19:40880
84-102	NTIS (US Sales Only), PC A02/MF A01		DE85781049	MN -34D	19:40602
84-110	NTIS (US Sales Only), PC A02/MF A01		DE85781052	MN -34D	19:40540
84-118	NTIS (US Sales Only), PC A03/MF A01		DE85781054	MN -46	19:40881
84-121	NTIS (US Sales Only), PC A02/MF A01		DE85701740	MN -34A	19:39694
84-122	NTIS (US Sales Only), PC A02/MF A01		DE85701892	MN -28	19:39823
84-124	NTIS (US Sales Only), PC A02/MF A01		DE85701761	MN -20	19:39745
84-126	NTIS (US Sales Only), PC A02/MF A01		DE85701805	MN -46	19:40882
85-001	NTIS (US Sales Only), PC A13/MF A01		DE85781050	MN -34D	19:40541
RE-A-					
77-045	*See* EGG/LTR-1141-30		DE85015471	MN -78	19:39280

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
77-098-Suppl.1	*See* EGG/LTR-129-11-Suppl.1	E 1.99:	DE85015434	MN -78	19:39275
77-131	*See* EGG/LTR-1310-20	E 1.99:	DE85015476	MN -78	19:39284
77-145	*See* EGG/LTR-112-132		DE85015453	MN -78	19:39265
77-148	*See* EGG/LTR-112-133	E 1.99:	DE85015452	MN -78	19:39266
78-002	*See* EGG/LTR-112-121		DE85015450	MN -78	19:39264
78-008	*See* EGG/LTR-121-4	E 1.99:	DE85015460	MN -78	19:39273
78-013	*See* EGG/LTR-1144-26		DE85015454	MN -78	19:39282
78-019	*See* EGG/LTR-115-39	E 1.99:	DE85015447	MN -78	19:39272
78-029	*See* EGG/LTR-111-90		DE85015466	MN -78	19:39260
78-054	*See* EGG/LTR-123-7		DE85015446	MN -78	19:39274
78-062	*See* EGG/LTR-114-96		DE85015441	MN -78	19:39214
78-066	*See* EGG/LTR-114-97		DE85015443	MN -78	19:39268
78-080	*See* EGG/LTR-132-1		DE85015431	MN -78	19:39276
78-107	*See* EGG/LTR-1115-43		DE85015440	MN -78	19:39278
78-110	*See* EGG/LTR-111-100	E 1.99:	DE85015439	MN -78	19:39261
78-131	*See* EGG/LTR-1217-4		DE85015457	MN -78	19:39283
78-169	*See* EGG/LTR-113-53	E 1.99:	DE85015442	MN -78	19:39267
RE-E-					
77-164	*See* EGG/LTR-10-25	E 1.99:	DE85015427	MN -78	19:39258
77-172-Suppl.1	*See* EGG/LTR-141-62-Suppl.1	E 1.99:	DE85015435	MN -78	19:39277
RE-P-					
78-075	*See* EGG/LTR-111-102		DE85015429	MN -78	19:39262
REG/G-					
6-85-Draft	US Nuclear Regulatory Commission, Washington, DC 20555		TI85901688	MN -16	19:40046
RFP-					
3850	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014769	MN -15	19:38964
3855	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014904	MN -38	19:39767
3857	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015256	MN -10	19:39679
RHO-BW-CR-					
145P	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014846	MN -70	19:40349
146P	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE85014665	MN -70	19:40350
148P	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015252	MN -70	19:38949
RHO-BW-SA-					
412P	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014938	MN -70	19:38923
RHO-PB-SR-					
10-B-WM-Mar.85	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014663	MN -70	19:38924
10-B-WM-May-85	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014664	MN -70	19:38925
RI-					
166	NTIS (US Sales Only), PC A02/MF A01		DE85781335	MN -37	19:40047
RR-					
1803	*See* BHRA-85/15/XAB				19:39433
1871	*See* BHRA-85/33/XAB				19:39714
SAAS-					
318	NTIS (US Sales Only), PC A03/MF A01		DE85701650	MN -80	19:39195
319	NTIS (US Sales Only), PC A03/MF A01		DE85701602	MN -4	19:40172
320	NTIS (US Sales Only), PC A02/MF A01		DE85701663	MN -37	19:40048
321	NTIS (US Sales Only), PC A03/MF A01		DE85701643	MN -41	19:40914
SAND-					
83-2675	*See* NUREG/CR-4213		TI85016136	MN -80	19:39358
84-0060	*See* NUREG/CR-3638	E 1.99:	TI85015372	MN -78	19:39353
84-0804C	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE85006106	MN -70	19:38926
84-1427C	NTIS, PC A03/MF A01		TI85006763	MN -78	19:39366
84-2636	NTIS, PC A99/MF A01; 1 (GPO Dep.)	E 1.99:	DE85016031	MN -70	19:38927
84-7209	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014931	MN -70	19:38928
85-0024C	NTIS, PC A02/MF A01 - GPO		TI85014642	MN -70	19:38929
85-0076C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85006740	MN -92a	19:38789
85-0135	*See* NUREG/CR-4138		TI85015258	MN -80	19:39357
85-0156C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015154	MN -25	19:39557
85-0175	*See* NUREG/CR-4137		TI85015569	MN -78	19:39356
85-0191C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013755	MN -15	19:38965
85-0198C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85011188	MN -90d	19:38705
85-0233C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015163	MN -25	19:39558
85-0254C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85008407	MN -90d	19:38706
85-0305C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85008418	MN -90d	19:38707
85-0308C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015141	MN -34	19:41099
85-0310C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015505	MN -25	19:39622
85-0317C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014840	MN -34A	19:39590
85-0333C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015165	MN -25	19:39591
85-0334C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015139	MN -45	19:40103
85-0356C	NTIS, PC A02; 3		DE85015507	MN -37	19:40094
85-0366C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015166	MN -45	19:39559
85-0381C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015161	MN -15	19:38966
85-0383C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015143	MN -45	19:39695
85-0405C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015150	MN -25	19:39592
85-0406C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015156	MN -25	19:39623
85-0415C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014707	MN -37	19:40095
85-0435C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015489	MN -25	19:39624
85-0484C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015140	MN -25	19:39560
85-0497C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015153	MN -45	19:40104
85-0592C	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014437	MN -25	19:39680
85-0635C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014703	MN -25	19:39561
85-0742C	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99:	DE85009813	MN -37	19:40060
85-0767C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	TI85015168	MN -15	19:38967

Report Number	*Availability Source*	*File Number*		*Distribution Category*	*Abstract Number*
85-0773C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015152	MN -70	19:38930
85-0829C	NTIS, PC A02/MF A01 - GPO (GPO Dep.)	E 1.99:	TI85014333	MN -70	19:38950
85-0850	NTIS, PC A12/MF A01 (GPO Dep.)	E 1.99:	DE85016030	MN -25	19:39562
85-1046C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013948	MN -32	19:41090
85-1125C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014839	MN -92a	19:38790
85-1224C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015145	MN -15	19:38968
85-1235C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015142	MN -21	19:41044
85-1338C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013958	MN -38	19:39824
85-1363C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013949	MN -45	19:40105
85-1372C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85013952	MN -91	19:38816
85-1439C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015167	MN -66c	19:39049
85-1440C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013747	MN -38	19:39734
85-1441C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015492	MN -25	19:39625
85-1451C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014709	MN -28	19:39880
85-1452C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014462	MN -28	19:39825
85-1487C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85013788	MN -37	19:39783
85-1514C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015144	MN -34A	19:39593
85-1570C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014841	MN -15	19:38969
85-1576C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014837	MN -15	19:38970
85-1597C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015159	MN -45	19:39563
85-1670C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015160	MN -15	19:38971
85-7153	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85015606	STD -71	19:38859
SCPRI-RM-					
8-1984	NTIS (US Sales Only), PC A03/MF A01		DE85751930	MN -11	19:40143
9-1984	NTIS (US Sales Only), PC A03/MF A01		DE85751929	MN -11	19:40144
10-1984	NTIS (US Sales Only), PC A03/MF A01		DE85751928	MN -11	19:40145
SCPRI-RT-					
3-1984	NTIS (US Sales Only), PC A03/MF A01		DE85751927	MN -11	19:40146
SERI/STR-					
211-2703	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE85012139	MN -63	19:39001
SERI/TP-					
212-2753	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85012134	MN -63	19:39002
252-2738	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85012142	MN -64	19:39018
SERP-E-					
143	*See* IFVE-ONF-83-143		DE85701795	MN -34D	19:40519
SKBF-KBS-SP-IR-					
83-04	NTIS (US Sales Only), PC A04/MF A01		DE85701874	MN -41	19:38951
SKBF-KBS-TR-					
83-75	NTIS (US Sales Only), PC A03/MF A01		DE85781315	MN -70	19:38931
83-76	NTIS (US Sales Only), PC A04/MF A01		DE85781316	MN -70	19:38932
84-01	NTIS (US Sales Only), PC A03/MF A01		DE85781317	MN -70	19:38933
84-05	NTIS (US Sales Only), PC A03/MF A01		DE85781085	MN -51	19:40173
SLAC-					
282	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014895	STD -34D	19:40542
SLAC-CN-					
301	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015136	MN -28	19:39826
305	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015138	MN -28	19:39827
SLAC-PUB-					
3493	*See* RAL-84-110		DE85781052	MN -34D	19:40540
3636	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014291	MN -28	19:39881
3647	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014292	MN -28	19:39828
3676	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014364	MN -34D	19:40543
3680	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85013069	MN -34D	19:40544
3686	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014365	MN -34D	19:40545
3698	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014354	MN -34D	19:40638
3716	NTIS, PC A02; 3 (GPO Dep.)	E 1.99:	DE85015261	MN -28	19:39802
SOL-					
85-10	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015095	MN -32	19:41091
85-11	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE85015096	MN -32	19:41092
SRD-R-					
298	NTIS (US Sales Only), PC A02/MF A01		DE85781326	MN -37	19:40049
309	NTIS (US Sales Only), PC A04/MF A01		DE85781308	MN -37	19:39735
STDR-					
84-28	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85005214	MN -90g	19:39420
TE-					
4258-5-84-Vol.1	*See* DOE/ET/11292-1893-Vol.1	E 1.99:	DE85009358	STD -93A	19:39421
4258-5-84-Vol.2	*See* DOE/ET/11292-1893-Vol.2	E 1.99:	DE85009359	STD -93A	19:39422
4258-5-84-Vol.3	*See* DOE/ET/11292-1893-Vol.3	E 1.99:	DE85009360	STD -93A	19:39423
4258-5-84-Vol.4	*See* DOE/ET/11292-1893-Vol.4	E 1.99:	DE85009361	STD -93A	19:39424
TN-					
1844	*See* BHRA-85/27/XAB				19:39454
TR-					
14	*See* AD-A-152760/5/XAB				19:40433
16	*See* AD-A-152762/1/XAB				19:40434
18	*See* AD-A-152763/9/XAB				19:40793
38	*See* AD-A-152928/8/XAB				19:39742
617-F	*See* AD-912787/9/XAB				19:39740
0084A(5940-05) -2	*See* AD-A-152320/8/XAB				19:40428
TRITA-MEK-					
84-05	NTIS (US Sales Only), PC A03/MF A01		DE85781068	MN -4	19:39681
TVA/ONRED/LER-					
85/ 16	NTIS, PC A05/MF A01		DE85901751	MN -61F	19:39003
TVA/PE/CEM-					
85/ 48	NTIS, PC A05/MF A01; 1		DE85901752	MN -95	19:39432

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TVA/PE/OE-					
85/ 28	NTIS, PC A02/MF A01		DE85901870	MN -97e	19:38991
TVA/PUB-					
85/ 27	NTIS, PC A06/MF A01; 1		DE85901736	MN -11	19:38993
UCID-					
19227-84	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015419	MN -05	19:39377
19988-Vol.1	*See* NUREG/CR-3660-Vol.1		TI85015267	MN -78	19:39354
20297-85-2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85015503	MN -90a	19:38755
20315	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85006139	MN -41	19:40211
20398	*See* NUREG/CR-4239		TI85015800	MN -41	19:40045
20448	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85014856	MN -22	19:38835
20459	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE85014892	MN -38	19:39736
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TZ United Republic of Tanzania

UA Ukrainian Soviet Socialist Republic (Ukrainian SSR)
UG Uganda
US United States of America (USA)
UY Uruguay

VA Holy See
VD Democratic Republic of Vietnam
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VS Republic of Vietnam

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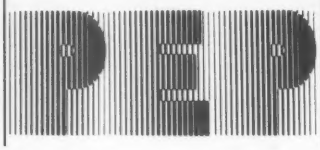

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